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Wide World Photo

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With the Editor

For a long time there has been much discussion of Henry Ford's plans with regard to the development of a low-powered airplane of the lightplane class. Until last Summer this discussion consisted for the most part of a series of rumors which took a multiplicity of forms. At the time of the start of the Airplane Reliability Tour, however, Mr. Ford's first "flivver" airplane was shown to the public. Few details have been made available concerning this plane but a description of the machine is published this week in AVIATION. The machine is regarded by the Ford organization purely as an experimental development and, it is understood, there is no intention of placing machines of this type on the market at this time. However, since its first appearance when it was flown at Dearborn Airport last Summer a new engine has been designed for the little machine to replace the Anzani with which it was originally equipped, and this might be taken as indicating a serious intention on the part of the manufacturers, eventually, to enter the lightplane field of aircraft manufacture. If this surmise is correct it naturally has a great deal of interest attached to it and future developments will be watched.

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Aero Engines Under Review

THE PARIS Aero Show was, perhaps, a little more "international" as regards its display of engines than it was as far as airplanes are concerned In addition to the thirty-two French engines exhibited, two British firms, both, curiously enough, champions of the air-cooled engine, displayed, in all, seven engines and there were, too, representatives of Italian and Czechoslovakian airplane engine constructors at the Show. Thus, it may be said that, in general, the Paris Show gave a very fair idea of the present trend of engine construction in Europe

Undoubtedly the most outstanding feature of the Show, from the viewpoint of engine development was the extent to which the air-cooled radial engine is, apparently, coming into favor. Particularly is this point interesting in the case of the French aircraft industry The Show marked the greatly increased attention being given in France to the radial air-cooled powerplant, a situation fostered, no doubt, by the extensive use of the French-built Jupiter engine during the past year. It was reported, for example, that the Jupiter engine was fitted into approximately fifty percent of the planes exhibited at the Show.

These engines, themselves, call for little comment, since they follow the general lines of radials, the new Lorraine Dietrich air cooled engines resembling very closely the well-known Armstrong Siddeley Jaguar with the double row staggered cylinders An interesting departure in this class is the Salmson radial air-cooled AB 18 eighteen cylinder 460 hp engine in which the cylinders, arranged in two rows, are not staggered but are placed one directly behind the other. The immediate thought is that the rear cylinders would tend to become overheated owing to the shielding effect of the front row. The manufacturers claim however, that this is not the case, pointing firstly, to the fact that the fins of the cylinders in tandem pairs, are interconnected, allowing an even distribution of heat and heat dissipation, and, secondly, that when operating in the slipstream of a propeller, the rear cylinders are actually only partially shielded inasmuch as the slipstream is not parallel to the longitudinal axis of the machine

Turning to water-cooled engines it is very noticeable that, in the majority of French engines of the higher powers, the necessary cylinder capacity is obtained by employing many cylinders rather than by using a large individual cylinder capacity, as is more or less the custom in this country. For example, no less than four of the engines exhibited had eighteen cylinders The highest powered engine of these four developed 700 hp

Judging by present trends in American design, twelve cylinders is considered ample for an engine of this power and even higher While there are certainly a number of technical considerations involved, to the laymen it would seem that the smaller number of cylinders has a direct advantage for it means fewer valves, fewer spark plugs and, in fact, a very material reduction in the complicity of the engine, which in turn means increased reliability So that it would seem we have little to learn from the French practices in this connection.

It is interesting also to draw attention to the apparent popularity of what has come to be called the "broad-arrow" type of engine, especially for the higher powers. Usually there are 60 deg between the banks of cylinders, either four or six in a row so that the two outer banks are set at 120 deg to each other Of course, this form of construction shortens considerably the overall length of an engine of a given power but it also widens the engine and adds materially to the problems of streamlining the cylinder banks under a suitable cowling. It is, in fact, one of the great advantages of the American high powered engines, such as the Packard 1500 and Curtiss D 12, that these powerplants are comparatively narrow for their power output and lend themselves, therefore, to installation in the nose of a pursuit plane fuselage, in which type speed is of such importance

Among the more or less novel features in the engines at the Paris Show was the Panhard-Levassor "Sans Soupapes" (valveless) engine in which the sleeve valve principle is employed This engine recently secured second place in the French engine competition during the trials of which one of the engine's chief features was its low gasoline consumption This development is particularly interesting at a time when an American engine employing much the same valve principle is about to enter the market, even though the American product is to be an air cooled engine whereas the Panhard Levassor is a water-cooled powerplant.

No discussion, at this time, of French engine development would be complete without mention of the Caffort twelve-cylinder horizontally opposed engine which it is claimed, develops 500 hp Few details are available concerning this engine and it is understood that it has only been given preliminary trials, greater power being expected during subsequent tests The engine, however, is interesting in view of its novel arrangement which would lend itself very admirably to installation in the leading edge of the thick wing of a giant airplane In fact, the airplane, to be equipped with, for example, twin engines of this type fitted into the wings would not have to be particularly large for, judging from the photograph it might be estimated that the total depth of the Caffort engine is something less than eighteen inches at the outside and the wing depth of a Fokker Tri-Motor monoplane or a Ford Stout three-engine transport near the fuselage is approximately of this depth The Caffort engine may, therefore, have wide possibilities

Engines at the Paris Aero Show

European Engine Development Well Represented at Grande Palais

IN ADDITION to the very characteristic showing of airplanes at the Tenth Paris Aviation Salon, which was held at the Grande Palais, Paris, Dec 3-19, the exhibition included a very representative group of engines. There were, in all, forty-eight engines exhibited and of these thirty-two were French, seven were British, four were Italian and five were of Czechoslovakian manufacture. And, characteristic of the increasing popularity of the air-cooled stationary radial engine, there were no less than nineteen engines of this type among the exhibits. In alphabetical order, the individual exhibits will, hereafter, be briefly described, with, as far as possible, the most important features of each engine brought out. To *The Aeroplane* (*London*), AVIATION is indebted for much of the information hereinafter contained.

Armstrong-Siddeley

The British firm of Armstrong-Siddeley Motors exhibited a complete range of air-cooled engines from the 60 hp Genet to the 400 hp Jaguar.

The cylinders of all Armstrong-Siddeley engines are of compound construction, with steel barrels, machined from the solid, screwed into aluminum heads and locked by a ring-nut which appears externally as a radiating fin. The cylinder bases are screwed into steel adapters pinned into the crankcase, and are locked into position by a split clamping ring.

Crankcases, of aluminum alloy, are open ended castings carrying the cylinders in spigots, the tappet guides and a flange for the engine bearer. The crankcase rear cover carries the crankshaft rear bearing and has cast in it a short cylindrical induction chamber containing a fan. The front cover carries the crankshaft front journal bearing and the thrust bearing, and also the cam, gas starter and oil-pump drives.

The crankshaft is made in one piece, and counterbalanced by bronze balance weights, and is supported in roller bearings. A double-acting ball thrust race is also fitted.

Connecting rods consist of a combination of one master rod for each row of cylinders and a set of articulated auxiliary rods. The big ends have plain bearings and the articulating and gudgeon pins are all of the floating type. Pistons are "Y" alloy forgings each with two gas rings and scraper which number two in the Jaguar and Lynx and one in the Mongoose and Genet. Two valves are fitted to each cylinder head. These close on bronze seats pressed into the head castings when the heads are hot. The valves are operated by pushrods and rockers from a cam pack concentric with the crankshaft and driven therefrom by an epicyclic train of gears.

The Jaguar

In the Armstrong-Siddeley Jaguar engine of 385-400 hp, there are two staggered rows each of seven cylinders of 5 in bore by 5½ in stroke driving a two-throw crankshaft. Two fourteen-cylinder magnetos are carried from the rear crankcase cover. The compression ratio is 5/1, the normal output is 365 hp at 1,700 r p m, and the maximum 425 hp at 1 900 r.p.m. The weight complete is 770 lb, the fuel consumption 56 pints per hp hr. Overall diameter of the engine is 44 in.

The Lynx (200 hp) engine has one row of seven cylinders 5 in bore by 5½ in stroke driving a single-throw crankshaft. The engine is thus half a Jaguar, having the same arrangement of magnetos (seven cylinder type). The compression ratio is 5/1, the normal output is 200 hp at 1620 r p m and the total weight 480 lb. The overall diameter is the same as that of the Jaguar.

The Mongoose (125 hp) is a five-cylinder engine with cylinders of the same size as those of the Jaguar and Lynx. The general disposition and detail design follows that of the larger engines with one or two exceptions. The magnetos, for example, are at the front instead of at the back of the engine. A somewhat lighter type of piston is used, with only one instead of two scraper rings. The compression ratio is again 5/1, the normal output 125 hp at 1,620 r p m, at which output seven gallons of fuel are used per hour together with 2½ pints of oil. The overall diameter is approximately the same as that of the Lynx.

In the Genet, a five-cylinder 60 hp engine, the designers had in mind the production of a satisfactory engine for private ownership planes of low horsepower. In this engine, which made its first appearance at the British Lightplane Competition in 1926, there are five radially arranged cylinders of 4 in bore and stroke, working at a compression ratio of 5 2/1. As with the Mongoose, magnetos are carried at the front of the engine. The normal output is 65 hp at 1,850 r p m, the maximum is 75 hp. The total weight is 168 lb and the fuel and oil consumption 757 pints and 03 pints per hp hr.

Breitfeld Danek

The firm of Breitfeld Danek and Co of Prague, Czechoslovakia, exhibited two water-cooled engines of the super-compressed type intended for work at high altitudes. The cylinders of each are of the same dimensions. The lower powered engine, the Perun II of 240 hp, has six vertical cylinders, each with a separate welded-on sheet steel jacket, tied together at the head by a cast aluminum camshaft casing. Each cylinder has two valves only, and is clamped into the crankcase by dogs between successive cylinders bearing on flanges on the barrel. Magnetos, oil pumps and water pumps are carried at the rear end of the crankcase. A carburetor, with a single-float chamber and three separate chokes is fitted. All three supply gas to a common inlet manifold, the central choke supplying a somewhat over-rich mixture, and the other two a decidedly weak mixture. The throttles are so interconnected that the one controlling the central choke opens first, and is nearly wide open before the other two come into play.

For operation at low altitudes the central choke and jet supplies the greater proportion of the gas, and the engine runs partially throttled on a rich mixture without fear of detonation occurring. As height is gained further movement of the throttle control opens the two weak mixture throttles, and the engine is supplied with an increasing volume of increasingly weakened mixture.

The Perun II has a bore and stroke of 160 mm and 190 mm respectively, a compression ratio of over 6/1 and normally develops 240 hp at 1,400 r p m. The weight dry is 694 lb and the fuel consumption 0 42 lb per hp hr.

The Breitfeld Danek B D 450 hp engine is a twelve-cylinder, 60 deg. Vee, with separate steel cylinders and water jackets, having four valves per cylinder. Each line of cylinder blocks is united at the head by a cast aluminum camshaft casing, which completely encloses the overhead valve gear.

Magnetos, oil pumps and water pumps are at the rear end of the crankshaft, and carburetors are fitted between cylinders. They appear to differ in form and arrangement from the carburetor fitted to the Perun II, but apparently work on the same principle, and the engine has the same high altitude characteristics.

Bristol Engines

The Bristol Aeroplane Co, of England, exhibited the Jupiter, Lucifer, and Cherub engines, all of the radial air-cooled type. The Jupiter VI is a nine cylinder, air-cooled radial engine nominally of 450 hp actually built in three different models. The first is the high-altitude type with a 6 3 compression ratio, which cannot be opened out to full throttle at less than 5 000 ft. This engine develops 425 hp at 1,700 r p m and 465 hp at 1,870 r p m up to an altitude of 5,000 ft.

The second type—the standard military type—has a compression ratio of 5 3/1. It develops 450 hp at 1,700 r p m and 485 hp at 1 870 r p m. The third type is the commercial type with a compression ratio of 5/1, giving 420 hp at 1,700 r.p.m. and 460 hp at 1,800 r p m.

The master connecting rod and the big end are machined in one piece from a forging. Cylinders are of steel machined from a forging and have closed heads in which the valve seats are formed. To these aluminum alloy castings in which are formed the valve ports are very carefully fitted. There are four valves per cylinder.

Valves are push-rod operated from a cam-pack, concentric with the crankshaft and driven therefrom by epicyclic gearing. Magnetos, oil pumps, gas-starter distributor, rev.-counter drive and gun synchronising gears are driven from the rear end of the crankshaft.

A special feature of the Jupiter engine is the induction system. In the rear half of the crankcase there is an annular chamber into which is inserted an aluminum alloy ring whose section is everywhere a three-legged star. This divides the aforesaid annular space into three channels. This ring is twisted, so that each of the three channels revolve three revolutions in the circumference of the ring. Nine equally-spaced induction pipes are led out of the annular chamber and it will be seen, therefore, that each channel in the twisted ring mates with three equally-spaced induction pipes, and the whole arrangement really forms a set of three induction manifolds each serving three cylinders.

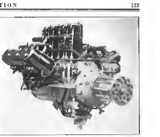
The Jupiter has a split crankcase built up from a duralumin forging. The crankshaft is built up from two nickel-chrome steel forgings. The crankpin, front crank web and propeller shaft are in one piece, the other piece comprising the rear crank web and the rear journal. The Jupiter VI has cylinders of 5¾ in bore and 7½ in stroke. The weight of the complete engine is 730 lb.

The Bristol Lucifer Series IV is a three cylinder air-cooled engine normally of 120 hp. The cylinders are of the same bore as those of the Jupiter but have a stroke of only 6¼ in. The general design of the cylinders is similar to that of Jupiter cylinders. Four valves per cylinder are fitted. The crankcase is an aluminum casting of barrel form with a circular mounting flange at the after end. The crankshaft is in one piece, and is carried on roller bearings. It is fitted with a split big end attached to the master connecting rod, and with two auxiliary rods articulated to it.

The valve gear is generally similar to that of the Jupiter.

The Lucifer develops 130 hp at 1,700 r p m with a maximum of 140 hp at 1 870 r p m. At normal output the fuel and oil consumption are, respectively, 54 pints and 33 pints per hp hr. The weight complete is 330 lb.

The Cherub III is of the two cylinder horizontally-opposed air-cooled type, with a bore and stroke of 90 mm x 96 mm, with a compression ratio of 5 5/1, developing normally 32 hp at 2,900 r p m, with a maximum output of 36 hp at 3,200 r p m. The weight complete is 100 lb, and at normal r p m, 2 gal of fuel and 1 pint of oil are consumed per hr.



The twelve-cylinder broad arrow Farman 500 hp engine

The cylinders have steel barrels, with aluminum alloy heads bolted on. Two valves are set in each head, arranged radially to the cylinder bore, and bed on alloy steel seats screwed into the head.

Caffort

The French firm of Caffort showed a very novel form of twelve-cylinder water-cooled engine, in which the cylinders were arranged in two banks of six each horizontally opposed, so that the engine is very flat and lends itself to installation in the wings of airplanes in which the leading edge is thick enough. The crankshaft is of the normal six-throw type with pins spaced 120 deg apart, built up in three pieces. Connecting rods on one cylinder block are of the normal type with split big ends. On the other block, the big ends are bifurcated and embrace the big ends of the opposite block.

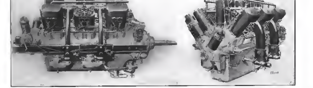
Four valves per cylinder are fitted. These are operated by two overhead camshafts—one for inlet and one for exhaust valves—to each block.

The Caffort engine has cylinders 145 mm and 150 mm, a compression of 5 3/1 and develops 500 hp at 2 000 r p m of the crankshaft for a dry weight of 1 320 lb. It is fitted with a reduction gear having a ratio of 1 88/1.

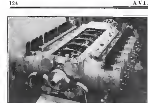
The sample engine exhibited had only been given preliminary tests during which an output of 510 hp was obtained. It is expected that this will be increased later.

The Farman Engines

The well-known Farman company of France exhibited two water-cooled engines of the broad arrow type, one of which



Two views on the 700 hp Farman engine



The 12-cyl horizontally opposed Caffort engine of 500 hp This is something entirely new in engines and presents interesting possibilities for airplanes in which engines of this type might be placed in the section of the wing

was the twelve-cylinder 500 hp engine and the other the eighteen-cylinder 700 hp engine The former engine is that which was employed in the Breguet XIX in the notable long distance flight of 30 hr duration from Paris to Bandar Abbas a distance of 3,200 miles, and which has a number of other World duration records to its credit This engine, the Farman 12w E has three rows of four cylinders set at an angle between rows of 60 deg Cylinders are of steel in pairs with a common sheet steel jacket to each pair Valves are overhead and push-rod operated from two camshafts one lying between each pair of cylinders The rocker gear is enclosed in cast aluminum cases, one to each pair of cylinders All auxiliary drives are at the front end of the engine.

Two magnetos are driven from a cross-shaft above the crankshaft at the front end of the crankcase

The 500 hp Farman has cylinders 130 mm bore 160 mm stroke, a normal compression ratio of 5 5/1, normal and maximum outputs of 500 hp. at 2,150 r p m and 560 hp at 2,200 r p m. The direct-drive engine weighs 1,035 lb, the geared type 1,150 lb Fuel and oil consumption are said to be 5 lb and .02 lb per hp hr

The engine is arranged such that either a direct propeller drive is employed or a reduction gear of either 2/1 or 1.35/1 may be employed. The Farman company showed on its stand a partially stripped engine of this type which had done 300 hr without overhaul Cylinders, valve seats and piston rings were in excellent condition and there was very slight play in the big ends and none in the little ends

The 700 hp Farman is of similar design to the 12-cylinder type, but has three blocks of two cylinders in each row, making 18 cylinders in all The angle between rows is 40 deg, and the stroke of each cylinder is increased to 180 mm, the bore remaining 130 mm

Fiat Engines

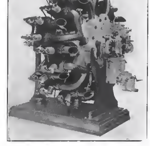
The Italian Fiat company exhibited three twelve-cylinder 60 deg engines of very similar design known, respectively, as the A.20 (440 hp), the A 22 (500 hp), and the A.25 of 900 hp In these engines each cylinder has a separate steel jacket and is fitted with four valves. There are two overhead camshafts for each line of cylinders, one operating exhaust and one inlet valves. The valve gear is entirely enclosed in a camcase which serves to tie each line of cylinders into a block.

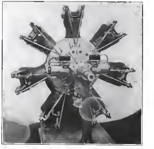
The types A 20 and A 22 have one master and one articulated rod on each crankpin In the A 25 one normal and one forked rod is used per crank. Carburetors are of the Stromberg type, fitted between cylinders. Two are used in the A 20 and A 22, and three in the A 25.

Two magnetos and two plugs per cylinder are fitted in the two smaller engines, and four magnetos and four plugs in the larger The A 20 has cylinders 115 mm x 150 mm, a compression of 5 6/1 and develops 410 hp normal, 455 hp maximum at 2,400 r p m It weighs 760 lb with water in jackets

The A 22 has cylinders 135 mm x 160 mm, a compression of 5 5/1 and develops 550 hp normal, 590 hp maximum at 2,100 r p m It weighs 1,010 lb with water in jackets

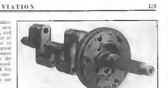
The A 25 has cylinders 170 mm x 200 mm, a compression of 5 1/1 and develops 900 hp normal, 990 hp maximum at 2 000 r p m The weight with water in the jacket is 1,860 lb





AIR-COOLED LORRAINES On the left the Lorraine Dietrich 42 fourteen cylinder air-cooled radial 450 hp which is said to be very similar to the Armstrong Siddeley Jaguar 385 400 hp. The rear side of the engine is seen. On the right the Lorraine-Dietrich seven cylinder 200 hp air-cooled radial, viewed from the front

The Gnome et Rhone Company of France which manufactures the French Jupiter engine, exhibited two of the new French Jupiter VI engines, one having a reduction gear, and the other of the direct drive type The overall diameter of the Gnome Rhone Jupiter has been reduced from 56 in to 52 3 in The French engine differs from the British original only in minor respects For example, the forged duralumin crankcase of the British Bristol engine is not used by the Gnome Rhone people, a normal cast case being employed Whether or not the two-piece crankshaft and the solid big end are used is not certain but it is believed to be the case The French Jupiter is slightly heavier than the British one and develops normally 480 hp according to claims.



An interesting photograph of the Lorraine-Dietrich reduction gear employed on many of their engines A close inspection of the picture will reveal the radial gears

Hispano-Suiza

The Hispano-Suiza exhibit included five types of engines, the early eight-cylinder Vee 150 hp and 300 hp engines, the twelve-cylinder broad-arrow of 450 hp which holds the World speed record and the twelve-cylinder 300 hp and 500 hp types. The original characteristics of the Hispano engines remain in these examples Each row of cylinders is an aluminum block into which steel liners are screwed when the material is hot Each cylinder has two valves operated by one camshaft for each block. The general details of all these engines are summarized below:

150 hp, 8-cylinder Vee 120 mm bore 130 mm stroke Normal output 150 hp at 1,500 r p m, max output 170 hp at 1,700 r p m Weight dry, 453 lb

300 hp, 8 cylinder Vee, 140 mm bore 150 mm stroke, 5 3/1 compression Normal output 300 hp

Type 50, 12-cylinder broad-arrow, 140 mm bore 150 mm stroke, 5.3/1 compression Normal output 450 hp 1,720 r p m Maximum output 487 hp 1,800 r p m Weight dry 826 lb

Type 51, 12 cylinder 60 deg Vee Bore 140 mm stroke 150 mm., 5.3/1 compression Normal output 500 hp 1,800 r.p.m.

Isotta Fraschini

Apart from several vertical six-cylinder engines of old type, the Italian Isotta Fraschini Company showed the new 500 hp Asso engine. This is a clean Vee type engine of twelve-cylinders set at 60 deg, having separate jacketed steel cylinders, each row tied together by an aluminum head and camcase casting The engine has cylinders of 140 mm bore and 150 mm stroke The compression ratio is 5.5/1 and the normal output 500 hp at 1,800 r p m The dry weight is 926 lb

Lorraine-Dietrich

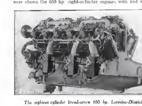
The Lorraine Dietrich Company showed seven different and modern engines four of which are of the broad-arrow type, two air cooled radials and one a 60 deg Vee type In the first type there was the now well-known 450 hp twelve-cylinder engine shown both with and without reduction gear The reduction gear is a 1 54/1 epicyclic gear. In addition, there were shown the 650 hp eight-cylinder engines with and without reduction gear Apparently this engine is produced by adding two cylinders to each row of the 450 hp type These engines have steel cylinders with welded-on steel jackets in pairs. The cylinders are 120 mm. bore and 180 mm stroke for all engines In the two 450 hp engines the compression is 5 5/1 and the normal output 450 hp at 1,900 r p m The weight is 816 lb for the ungeared and 915 lb for the geared engine

In the 650 hp type the compression is 6/1, the normal output 650 hp at 1,850 r p m., and the weight 1,232 lb for the direct-drive engine The weight of the geared model is not stated The geared and ungeared types differ in carburetor arrangements In the 700 hp Vee engine, the same cylinder arrangement in pairs is to be found The cylinders of this engine are, however, very much larger than those of the engines just discussed The bore and stroke are 175 mm. and 225 mm respectively, and the rated power is developed at 1,200 r p m. The weight is 1,870 lb

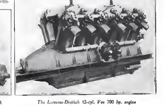
The Show marked the entrance of the Lorraine-Dietrich firm into the field of the air cooled radial engine by the exhibition of two engines of this type These engines are in many respects very similar to the British Armstrong-Siddeley Jaguar and Lynx radials The larger engine is a two row staggered fourteen-cylinder engine of 450 hp and the smaller a seven cylinder 200 hp engine The cylinders have a bore and stroke of 135 mm and 150 mm, respectively The larger engine develops 450 hp at 1,800 r p m and weighs 880 lb, while the seven cylinder engine develops 220 hp at 1,800 r p m and weighs 573 lb

Panhard and Levassor

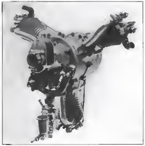
The Panhard and Levassor Company of France exhibited two 1924 engines of the Vee type One of them was of the poppet-valve type and was super-compressed so that it has to be run throttled at low altitudes, while the second was



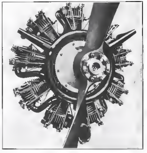
The eighteen cylinder broad-arrow 650 hp. Lorraine-Dietrich



The Lorraine-Dietrich 12-cyl. Vee 700 hp. engine



The little three cylinder Salmson AD 3 12 hp engine

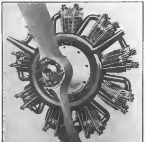


The Salmson AC 9, 120 hp engine

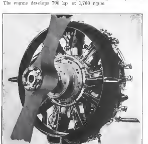
fitted with Knight sleeve-valves and represented an interesting example of the saving in frontal area by the elimination of the overhead valve gear The former engine, known as the V12M develops 500 hp at 1,550 r.p.m. and maintains this output up to 3,000 meters. It has cylinders 165 mm. bore by 170 mm stroke and weighs dry 1,295 lb The Knight valve engine, known as the V K 122, develops 450 hp

Renault

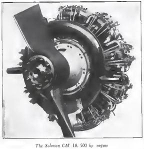
The Renault company is World-known as an engine manufacturer Along the exhibits of this firm at the Paris Show was the first prize winner in the French 1925 engine competition during which thirty non-stop runs of eight hours each were required The engine is a twelve-cylinder Vee of the same bore and stroke as the 480 hp engine rated down to 420 hp at the same r.p.m The modern Renault engines are all the twelve-cylinder 60 deg Vee type with steel cylinders and separate sheet steel jackets. The cylinders are tied together at the heads by a valve casing which carries the overhead camshaft The 480 hp Renault has cylinders of 134 mm. bore and 180 mm stroke and a compression ratio of 5.3/1 It develops 480 hp at 1,000 r.p.m and weighs 1,015 lb dry The 550 hp model is the same engine equipped with a spur reduction gear and rated at 550 hp at 2,000 r.p.m The engine weighs dry 1,090 lb Renault also showed a 700 hp engine which is produced both in geared and direct drive form like the others The bore is 160 mm, the stroke, 180 mm and the weight ungeared 1,375 lb and geared 1,485 lb. The engine develops 700 hp at 1,700 r.p.m



The Salmson AB 9 230 hp engine



The Salmson CM 9, 260 hp engine



The Salmson CM 18, 500 hp engine

The Salmson has long been well-known for its radial engines both of the air-cooled and of the water-cooled type. These types differ practically only in regard to the cylinders, the air cooled types having cast steel cylinders with fins while the water-cooled engines have cast steel cylinders with welded-on jackets The most interesting engine exhibited was the eighteen-cylinder type which is produced both air and water cooled. It is a double row engine not staggered and the cylinders are cast in pairs, each pair, when water-cooled having a common water jacket.

Three low powered engines, all air cooled, were exhibited, ranging from the little nine-cylinder 40 hp A.D.9 to the 125 hp nine-cylinder A.B.9 In the higher powers there were four engines all having the same sized cylinder. Two were single row nine-cylinder types and then the two eighteen-cylinder engines One of each of these is air cooled and the others are water-cooled The chief details of these engines are.

A.D.9, nine cylinders, 70 mm. bore 86 mm. stroke, air-cooled, 40 hp at 2,000 r.p.m. Weight 165 lb

A.C.7, seven cylinders, 100 mm. bore 130 mm stroke, air-cooled, 95 hp at 1,800 r.p.m Weight 287 lb

A.C.9, nine cylinders, 100 mm bore 130 mm stroke, air-cooled, 120 hp at 1,800 r.p.m Weight 374 lb.

A.B.9, nine cylinders, 125 mm bore 170 mm stroke, air-cooled, 230 hp. 1,700 r.p.m Weight 528 lb

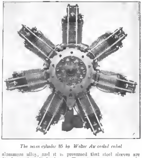
C.M.9, nine cylinders, 125 mm bore 170 mm stroke, water-cooled, 266 hp 1,650 r.p.m. Weight 550 lb

A.B.18, eighteen cylinders, 125 mm bore 170 mm stroke, air-cooled, 460 hp 1,700 r.p.m Weight 1,080 lb

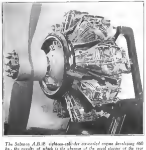
C.M.18, eighteen cylinders, 125 mm bore 170 mm stroke, water cooled, 500 hp Weight 1,012 lb

Sauda

The Sauda Cappa 18 engine, one of which was exhibited at the Show, is a twelve-cylinder water-cooled Vee engine with the cylinders and crankcase of one monobloc casting of aluminum alloy, and it is presumed that steel sleeves are fitted into the cylinder bores The entire engine is extremely clean in appearance A reduction gear of 1.4/1 is built into the engine The cylinder bore is 120 mm and stroke 135 mm The normal output is 400 hp at 1,600 r.p.m and the weight is 836 lb



The seven cylinder 85 hp Walter Air cooled radial



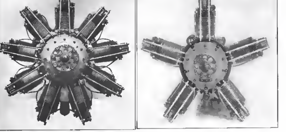
The Salmson A.B.18 eighteen-cylinder air-cooled engine developing 460 hp, the novelty of which is the absence of the usual stagger of the rear row of cylinders The cylinders are connected in tandem pairs through the fins and in this way the manufacturers claim adequate cooling of the rear cylinders

Walter Air-Cooled Engines

The Czechoslovakian Walter air-cooled radial engines have demonstrated themselves to be extremely reliable power plants. Three engines were exhibited, namely the 60 hp, 85 hp. and 110 hp. types, all of which are identical in detail, differing only in the number of the identical cylinders each engine possesses The cylinders are of steel with cast-on aluminum fins and a cast iron head bolted on Two overhead valves per cylinder are operated by pushrods in the normal manner. The carburetor and twin Scintilla magnetos are fitted to the rear of the crankcase The general details are as follows:

Bore 105 mm stroke 120 mm Five-cylinder type, normal output 60 hp. at 1,400 r.p.m, maximum 70 hp at 1,700 r.p.m Weight 224 lb Seven-cylinder type, normal output 85 hp 1,400 r.p.m, maximum 90 hp at 1,460 r.p.m Weight 275 lb Nine cylinder type, normal output 110 hp at 1,450 r.p.m, maximum 120 hp. at 1,600 Weight 335 lb

All three engines are said to consume .52 lb of fuel per hp hr



Two more Walter air-cooled engines. On the left the 110 hp unit and right the popular little 60 hp Walter engine

Pan-American Flight Progress

Major Herbert A. Dargue, commander of the Pan-American Flight, arrived at Salina Cruz, Mexico, Jan. 2, accompanied by his fellow fliers. They were welcomed at the field by President Chacon and cabinet officials, and later given a reception at the presidential palace. Major Dargue presented President Chacon with a letter of greeting from President Coolidge.

A few minutes past 10 a.m., Jan. 4, the fliers took off from Aurora Flying Field, for the hop to San Salvador. The St Louis led the other planes in the flight, but a few minutes after the New York had taken off, it developed gear trouble and the pilot was forced to land a third of a mile South of the field.

For awhile it was thought that the flight would be delayed until the New York was repaired or a reserve plane could be sent from San Antonio, but on Jan. 6 word was received from the War Department that the four planes should continue the trip, on the ground that the "ultimate success of the flight must not be jeopardized by an attempt to get all five planes through together."

The New York, which, in addition to crippled landing gear, also has a damaged hull, will take the water route to Panama, taking three days to complete the trip. The balance of the planes will proceed to Panama by way of the Central American countries. This latter course will require twenty days.

The reserve plane at Duncan Field has been shipped by way of New Orleans, to the Canal Zone, and if the New York cannot be repaired in time to accompany the other planes on the flight to Chile, the reserve plane will take its place.

Pal-Waukee Airport at Mount Prospect, Ill.

We wish to direct the attention of our readers to the correct address of the Pal-Waukee Airport & Service Station. This airport is located at Mount Prospect, Ill. Through a typographical error in an advertisement, the wrong address was given.

The Pal-Waukee Airport & Service Station are distributors of Swallow airplanes and maintain a modern and fully equipped field. The field, which is four-way, 2200 x 1200 ft., is located on Milwaukee Ave. at Palatine Road, twenty miles Northwest of the Chicago loop and five miles North of Des Plaines, Ill.

Air Mail Service Closes Year of Records

Statistics on file at the Post Office Department show that on Dec. 16, 1926, the Eastbound trans-continental planes broke three speed records between Chicago and New York. Pilot Jack Milatzo on this date flew from Chicago to Cleveland, 327 miles, in 1 hr., 59 min., or at the rate of 164.8 m.p.h. The best previous time was 2 hr., 2 min.

Pilot Harry Chandler flew from Cleveland to New York, 299 miles, in 2 hr., 21 min., or at the rate of 169.7 m.p.h. The best previous time was 2 hr., 30 min.

The flying time on this same date from Chicago to New York was 4 hr., 20 min., or at the rate of 167.3 m.p.h. The best previous time for this trip was 4 hr., 35 min.

The comparative speed records made during December, 1926, and December, 1925, between different air mail stations are as follows: New York to Cleveland, 1926, 2 hr., 21 min.; 1925, 2 hr., 52 min.; Cleveland to Chicago, 1926, 1 hr., 59 min.; 1925, 2 hr., 07 min.; Chicago to Omaha, 1926, 2 hr., 50 min.; 1925, 3 hr., 04 min.; Omaha to Cheyenne, 1926, 3 hr., 20 min.; 1925, 3 hr., 20 min.; Cheyenne to Salt Lake City, 1926, 2 hr., 40 min.; 1925, 3 hr., 02 min.; Salt Lake City to Reno, 1926, 3 hr., 27 min.; 1925, 3 hr., 47 min.; Reno to San Francisco, 1926, 1 hr., 36 min.; 1925, 1 hr., 28 min. Changeable winds affected the time on this route.

Navy Training Plane Designs Submitted

Designs have been submitted by fourteen aircraft designers and contractors to the Training Plane Competition Board appointed by the Secretary of the Navy to consider designs for the purpose of selecting for the navy a standard training plane. The time for submitting designs closed at midnight Dec. 21, and the Bureau of Supplies and Accounts has inspected the plans entered and turned them over to the Board for its consideration. The following companies submitted bids and designs for Navy training planes:

Curtiss Aeroplane and Motor Co.,
Thomas Morse Aircraft Corp.,
Aerial Service Corp.
Kentucky Aircraft Corp.,
Boeing Airplane Co.
Consolidated Aircraft Corp.
Sikorsky Manufacturing Corp.,
G. Fliss and Bros.,
Huff Daland Airplanes,
Buhl Verville Aircraft Co.,
Glenn L. Martin Co.,
Eberhart Aeroplane and Motor Co.,
Charles Ward Hall
Douglas Airplane Co.

Engines at the Paris Aero Show

Maker's Name	Designation	Type	Cooling	No. of Cylinders	Bore m/m	Stroke m/m	Compression	Normal Output	Maximum Output	Weight	Weight per hp	Fuel per hp hour	Oil per hp hour	Remarks
Armstrong Siddeley	Jaguar 385/400 hp	Radial	A	14	127	140	5/1	385 hp. 1700 r.p.m.	425 hp. 1900 r.p.m.	770 lb 348 kg	1.8 lb 0.82 kg	.53 lb 240 gr	.031 lb 14 gr	—
Armstrong Siddeley	Lynx 200 hp	Radial	A	7	127	140	5/1	180 hp. 1620 r.p.m.	210 hp. 1800 r.p.m.	480 lb 218 kg	2.28 lb 1.04 kg	.53 lb 240 gr	.031 lb 14 gr	—
Armstrong Siddeley	Mongoose 125 hp	Radial	A	5	127	140	5/1	125 hp. 1620 r.p.m.	150 hp 1770 r.p.m.	340 lb 154 kg	2.20 lb 1.03 kg	—	—	—
Armstrong Siddeley	Genet 60 hp	Radial	A	5	101.6	101.6	5.2/1	65 hp 1820 r.p.m.	75 hp	168 lb 76 kg	2.24 lb 1.02 kg	.55 lb 250 gr	.03 lb 14 gr	—
Breitfeld-Danek	B D 500 hp	60° Vee	W	12	160	190	—	450 hp 1400 r.p.m.	—	1100 lb 560 kg	2.45 lb 1.22 kg	.46 lb 195 gr	—	Super-compression altitude engine
Breitfeld-Danek	Perun 11	Vertical	W	6	160	190	—	240 hp. 1400 r.p.m.	—	506 lb 315 kg	2.0 lb 1.31 kg	.42 lb 190 gr	.020 lb 12 gr	Super compression altitude engine
Bristol	Jupiter VI 450 hp.	Radial	A	9	146	190	5.3/1	450 hp. 1700 r.p.m.	485 hp. 1870 r.p.m.	730 lb 331 kg	1.5 lb .68 kg	.53 lb. 245 gr	.03 lb 14 gr	—
Bristol	Lucifer IV 135 hp	Radial	A	3	146	159	5.3/1	130 hp 1700 r.p.m.	140 hp 1870 r.p.m.	330 lb 150 kg	2.36 lb 1.07 kg	.54 lb 242 gr	.037 lb 17 gr	—
Bristol	Cherub III 32 hp.	Horizontal Opposed	A	2	90	98.5	5.5/1	32 hp. 2900 r.p.m.	36 hp 3200 r.p.m.	100 lb 45.4 kg	2.78 lb 1.25 kg	.55 lb. 250 gr	.034 lb 16 gr	—
Capront	—	Horizontal Opposed	W	12	145	158	7.4/1	800 hp. 2000 r.p.m.	—	1320 lb 600 kg	2.64 lb 1.2 kg	.55 lb 250 gr	.044 lb 20 gr	1.85/1 reduction gear
Farman	12 WE 500 hp	Broad Arrow	W	12	130	160	—	480 hp. 2130 r.p.m.	560 hp 2200 r.p.m.	1160 lb 525 kg	2.0 lb .91 kg	.50 lb 225 gr	—	Reduction gear. Duration record Type
Farman	18 WD 700 hp	Broad Arrow	W	18	130	160	—	700 hp 1800 r.p.m.	820 hp 2100 r.p.m.	1730 lb 785 kg	2.1 lb .96 kg	.50 lb 225 gr	—	Reduction gear of various ratios available
Fiat	A 20 400 hp	60° Vee	W	12	115	150	5.6/1	410 hp	[illegible] hp. 2400 r.p.m.	760 lb 345 kg	1.67 lb 0.76 kg	—	—	—
Fiat	A 22 550 hp	60° Vee	W	12	137	180	3.8/1	550 hp	580 hp. 2100 r.p.m.	1011 lb 460 kg	1.72 lb 0.78 kg	—	—	—
Fiat	A 25 900 hp	60° Vee	W	12	170	200	5.1/1	900 hp	980 hp 2000 r.p.m.	1860 lb 845 kg	1.9 lb 0.86 kg	—	—	—
Gnome Rhone	Jupiter VI	Radial	A	9	146	190	—	—	450 hp 2000 r.p.m.	711 lb 320 kg	1.58 lb .71 kg	.55 lb 225 gr	.046 lb 21 gr	—
Gnome Rhone	Jupiter VI	Radial	A	9	146	190	—	—	—	—	—	—	—	2/1 reduction gear
Hispano-Suiza	180 hp.	90° Vee	W	8	120	130	—	180 hp. 1700 r.p.m.	178 hp. 1700 r.p.m.	[illegible] lb 208 kg	2.55 lb. 1.21 kg	—	—	—
Hispano-Suiza	300 hp	90° Vee	W	8	140	150	5.3/1	300 hp	—	—	—	—	—	—
Hispano-Suiza	50	Broad Arrow	W	12	140	150	5.3/1	450 hp 1825 r.p.m.	467 hp. 1800 r.p.m.	826 lb 375 kg	1.74 lb .77 kg	—	—	Speed Record Type
Hispano-Suiza	51	60° Vee	W	12	140	150	5.3/1	500 hp 1800 r.p.m.	520 hp. 1800 r.p.m.	925 lb 421 kg	1.78 lb .81 kg	—	—	Distance Record Type
Hispano-Suiza	52	60° Vee	W	12	120	140	5.3/1	350 hp 1800 r.p.m.	412 hp. 2000 r.p.m.	6[illegible] lb [illegible] kg	1.61 lb .74 kg	—	—	—
Isotta Fraschini	Asso	60° Vee	W	12	140	150	5.3/1	500 hp. 1800 r.p.m.	550 hp.	926 lb 420 kg	1.68 lb .76 kg	—	—	—
Lorraine Dietrich	450 hp	Broad Arrow	W	12	120	180	5.5/1	450 hp. 1900 r.p.m.	—	816 lb 381 kg	1.81 lb .85 kg	.53 lb* 235 gr	—	Altitude Record Type
Lorraine Dietrich	450 hp	Broad Arrow	W	12	120	180	5.5/1	450 hp. 1800 r.p.m.	—	915 lb 415 kg	2.02 lb .92 kg	—	—	1.54/1 epicyclic reduction gear
Lorraine Dietrich	650 hp	Broad Arrow	W	18	120	180	6/1	650 hp 1850 r.p.m.	700 hp 1900 r.p.m.	1272 lb 580 kg	1.78 lb .8 kg	—	—	—
Lorraine Dietrich	650 hp	Broad Arrow	W	18	120	180	—	—	—	—	—	—	—	1.54/1 epicyclic reduction gear
Lorraine Dietrich	No. 34 700 hp.	60° Vee	W	12	175	225	—	700 hp. 1200 r.p.m.	—	1870 lb 820 kg	2.66 lb 1.21 kg	.53 lb 240 gr	.044 lb 20 gr	—
Lorraine Dietrich	No. 42 450 hp	Radial	A	14	135	150	—	—	450 hp 1800 r.p.m.	88[illegible] lb 400 kg	1.66 lb .89 kg	—	—	—
Lorraine Dietrich	No. 47 220 hp	Radial	A	7	135	150	—	200 hp. 1650 r.p.m.	220 hp 1800 r.p.m.	573 lb 260 kg	2.6 lb [illegible] kg	—	—	—
Panhard & Levassor	V K 12 450 hp.	60° Vee	W	12	140	170	5.4/1	450 hp. 1700 r.p.m.	525 hp 1800 r.p.m.	1200 lb 545 kg	2.28 lb 1.04 kg	—	—	Knight sleeve valves
Panhard & Levassor	V12M 500 hp	60° Vee	W	12	165	170	6/1	500 hp 1550 r.p.m.	—	1325 lb 600 kg	2.6 lb 1.18 kg	—	—	Supercompressed high altitude type
Renault	420 hp.	60° Vee	W	12	134	180	—	420 hp 1950 r.p.m.	—	—	—	—	—	1st prize Concours de Grande Endurance 1925
Renault	480 hp.	60° Vee	W	12	134	180	5.8/1	480 hp. 1600 r.p.m.	520 hp 1650 r.p.m.	1015 lb 460 kg	1.95 lb .88 kg	—	—	—
Renault	550	60° Vee	W	12	134	180	—	550 hp 1800 r.p.m.	600 hp. 2000 r.p.m.	1060 lb 485 kg	1.81 lb .82 kg	—	—	Spur reduction gear
Renault	700	60° Vee	W	12	160	180	5.8/1	—	700 hp. 1700 r.p.m.	1385 lb 628 kg	1.96 lb .88 kg	—	—	—
Renault	700	60° Vee	W	12	160	180	—	—	700 hp 1700 r.p.m.	1485 lb 675 kg	2.12 lb .96 kg	—	—	Spur reduction gear
Salmson	A D 9	Radial	A	9	70	86	—	40 hp. 2000 r.p.m.	—	165 lb 75 kg	4.12 lb 1.88 kg	—	—	—
Salmson	A C 7	Radial	A	7	100	130	—	95 hp. 1800 r.p.m.	—	287 lb 130 kg	3.02 lb 1.37 kg	—	—	—
Salmson	A C 9	Radial	A	9	100	130	—	120 hp 1800 r.p.m.	—	374 lb 170 kg	3.12 lb 1.41 kg	—	—	—
Salmson	A B 9	Radial	A	9	125	170	—	230 hp 1700 r.p.m.	—	528 lb 240 kg	2.29 lb 1.04 kg	—	—	—
Salmson	A B 18	Radial	A	18	125	170	—	480 hp 1700 r.p.m.	—	1060 lb 480 kg	2.21 lb .94 kg	—	—	—
Salmson	C M 9	Radial	W	9	125	170	—	260 hp 1650 r.p.m.	—	550 lb 250 kg	2.1 lb .96 kg	—	—	—
Salmson	C M 18	Radial	W	18	125	170	—	500 hp. 1650 r.p.m.	—	1012 lb 460 kg	2.02 lb .92 kg	—	—	—
Sauda	Cappa 18	60° Vee	W	12	130	135	—	400 hp. [illegible] r.p.m.	—	856 lb 389 kg	2.00 lb .95 kg	—	—	1.4/1 reduction gear
Walter	60 hp.	Radial	A	5	105	120	—	60 hp 1400 r.p.m.	70 hp. 1600 r.p.m.	224 lb 102 kg	3.2 lb 1.45 kg	.52 lb. 235 gr	.035 lb 16 gr	—
Walter	85 hp	Radial	A	7	105	120	—	85 hp 1400 r.p.m.	90 hp. 1460 r.p.m.	275 lb 125 kg	3.05 lb 1.39 kg	.52 lb. 235 gr	.035 lb 16 gr	—
Walter	110 hp	Radial	A	9	105	120	—	110 hp 1450 r.p.m.	120 hp. 1600 r.p.m.	335 lb 152 kg	2.70 lb 1.25 kg	.53 lb 235 gr	.035 lb 16 gr	—

NOTE.—Weights do not include Oil and Water. Weight per hp based on maximum hp. where that figure is given.
Fuel per hp. where given by makers in terms of volume has been transformed to a weight basis assuming S.G. of fuel to be 0.70.

Duralumin Welding

The Possibilities and Methods of Gas Welding of Duralumin

By LIEUT. COMDR. WM. NELSON, (CC), U S N

THE METHODS of joining metallic materials available to the aircraft builder are either mechanical or thermal in nature. The thermal means embrace forge welding, gas welding, electric welding, soldering and brazing. All of these involve the partial or complete melting of metals similar to or different from the parts being joined. Forge welding and electric resistance welding do not require the use of any welding rod, whereas, all the others depend in whole or in part on the addition of a fused rod.

It is natural that all methods of joining steels have been tried on aluminum and its alloys. Unfortunately, the high thermal conductivity of aluminum and the presence of the oxide film on this metal has precluded the adoption of most of the thermal means of uniting. Welding aluminum alloys by forging appears to be so impracticable that it is doubtful if that means will ever be used. The oxide film which forms on aluminum alloys is so difficult to eradicate that forge welding remains in search of a method. Gas welding is the most successful of all of the melting processes and is covered in detail below. Electric welding of aluminum and duralumin is possible but considerable investigation must be done before this means can be considered to be of use outside of the laboratory. Soldering of this metal has been worked on in laboratories from time to time but too is still of too experimental a nature to be used in any production job. Brazing duralumin has not had sufficient demand to make any extensive experiments advisable.

In a broad sense if welding were completely satisfactory it could be used to advantage in joining many parts of all-metal aircraft which are now riveted. In a contracted sense, it could be used only in places where riveting is not cheaper. However, due to the elements of strength, resistance to corrosion, limited fatigue data, and such, the welding of aluminum in aircraft construction has been limited to repairs, manufacture of tanks, manufacture of cowling, etc., and to special non-strength features. Nevertheless, aircraft builders are presented with additional flexibility if the welding of aluminum alloys is within the capabilities of their shops; so, although still experimental in many ways, the use of this light metal in airplanes brings with it a need for knowledge of this subject.

Electric Welding

Resistance welding is commonly known as electric "butt" or "spot" welding. In this process the junction is made by allowing a large current of low voltage to flow through the place to be fused.

Electric butt welding of aluminum or duralumin is not known. Electric spot welding seems to present certain features which have practical application. A complete study has not yet been made, but considerable preliminary work on spot welding duralumin sheet in an automatic steel spot welding machine indicates that it can be done with a fair degree of success. In some work done recently, the spots were about 3/32 in. in diameter with a tenacity in tension equal to about 500 lb. per spot. Failure occurred by having a spot pull out of the sheets. The metal in the welds appeared to be burned, cracks, pits, and irregularities being the rule. Corrosion tests conducted on samples did not confirm conclusively an opinion that corrosion would concentrate in or near the point of weld. Some samples corroded did show a tendency towards electrolytic action between the metal in the spot and the sheet itself but it was not general.

Electric arc welding consists of using an electric arc to fuse the junction and the filler rod. An electrode of carbon acts as one of the poles in the circuit and the material being welded as the other pole. By proper manipulation of the carbon electrode an arc is struck and furnishes the heat necessary to melt the filler rod and fuse that and the parts being welded. The temperatures produced in the arc are exceedingly high and for that reason this method of welding is not conducive to good results where aluminum and duralumin are concerned.

Soldering

No success seems to have been had in using soft solders with aluminum. This is perhaps due to the failure to break down the oxide film on the basic metal by the relatively small amount of heat applied. Silver solders produce better results on the whole, but, so far, solders sufficiently satisfactory even to produce a joint are not generally available. The plating of the aluminum alloy parts to be soldered seems to be a necessary part of the operation in which case practically any solder will adhere to the plate if the plate will adhere to the aluminum concerned. The value of soldering is reduced further by the corrosion factor. Electrolytic action takes place in the vicinity of soldered joints, so that corrosion becomes a matter of serious concern in a location where everything should be done to avoid corrosion.

Gas Welding

Gas welding aluminum and duralumin is the one that presents the greatest actualities and possibilities in the aircraft industry. Gas welding in an atmosphere other than air may become a matter of general interest later on, but at the present time fusion-joining in air is the more feasible and practical. This particular means employs acetylene and oxygen or hydrogen and oxygen to produce the heat necessary to fuse the metal to be joined. Experience and the size of the material determine whether hydrogen or acetylene shall be used on a job of aluminum or duralumin welding. With relatively thick sheets it is necessary to use acetylene to get the required heat, whereas with very thin sheets, hydrogen serves to better advantage by tending to prevent burning.

In general aluminum sheet and aluminum casting are easier to weld than duralumin. All of these metals have a low melting point with a very small working range of temperature and a great deal of skill is required to produce satisfactory results. The weld as a rule is of a cast structure and contains the properties of that material, being brittle and subject to fatigue failure. In duralumin the material next to the weld is affected by the heat applied changing the physical properties to a material extent. Buckling, cracking and burning are more likely to occur in welding duralumin than in welding aluminum due perhaps to the changes set up in the surrounding metal by the heat of the torch.

Gas welding of duralumin has not been undertaken with any great degree of confidence by the aircraft industry as a whole. The reasons given are various but in the main it is believed that this lack of interest is due primarily to the difficulties encountered in the making of the welds. With that in mind most of that which follows consists of notes on the design of parts to be welded and the actual making of the weld in aluminum alloys.

First, there are certain design features which are very important in any work involving duralumin welding. Heat treated specimens of gas welded duralumin show a tensile strength of about 30,000 lb. per sq. in. with an elongation of 1.5 per cent to 5 per cent in 2 in. Heat treating the samples raises the tensile strength to about 40,000 lb. per sq. in. with no changes in the elongation. Welded duralumin heat treated and with dressed joint has an efficiency of 25 per cent to 80 per cent (55,000 lb. per sq. in.). So much for the figures. But, to insure satisfactory results the designer must also apply interest to the operation and the following points are material

in that respect:

(1) Make all welds as simple and as accessible as possible
(2) Reduce intersections of welds to a minimum
(3) Provide for expansion and contraction around welds by means of beads, grooves, dished heads, crowns, etc.,
(4) Use sheet metal or tube fittings in preference to cast fittings.
(5) Fittings should be set in and welded rather than being attached to the outside

The equipment used for welding with either acetylene or hydrogen is essentially the same as is used for light guage steel excepting that a lead-burner's torch is used in welding the aluminum alloys. The heat conductivity of aluminum is high so a large torch results in a lack of concentration with consequent jagged and unsightly welds. The small torch demands a smaller hose than the regular full size welding torch which in turn necessitates a reducing valve block. Other than that the equipment is not different from the ordinary gas welders outfit.

Filler rod employed in welding any of the aluminum alloys is usually of the same material as the parts being joined. Where one or both parts are aluminum, commercial soft annealed, pure aluminum wire 1/16 in. to ⅛ in. diameter is used. The welding rod for castings is an 8 per cent copper aluminum alloy wire. Strips sheared from the edge of sheets serve very well for welding rod, and give a material of the correct chemical composition.

Fluxes Used

The fluxes used in aluminum alloy welding seem to be a constant source of question. Many kinds of fluxes are available in the markets with perhaps as many kinds of opinions regarding their relative merits. The principal objections to most aluminum fluxes are that they are too hygroscopic causing a short life or that the melting point is too high or too low causing burning of the metal or of the flux. The following flux has been subjected to experiment and to shop use and should meet most of the airplane builders needs:

Sodium Chloride	32%	by weight
Sodium Fluoride	20%	"
Potassium Chloride	24%	"
Lithium Chloride	24%	"

This flux produces a sound, clean, uniform weld and permits welding at a more rapid rate than most other compounds will allow. The corrosive action of fluxes cannot be taken into consideration in comparing their relative merits, for all are more or less hygroscopic and, accordingly, active agents in inducing corrosion in duralumin. The merits of the fluxes must be based on the results obtained by their use in making welds.

Flux, as it is purchased, comes in a pulverized form. Owing to the hygroscopic nature of this material it should be kept in sealed bottles only enough being mixed for immediate use. The flux is mixed with distilled water in a porcelain dish to the consistency of a thin paste and is applied to the seam and to the wire with a small brush. It is usual to preheat the seam slightly so that the water in the flux will evaporate when applied leaving the dry powder in place.

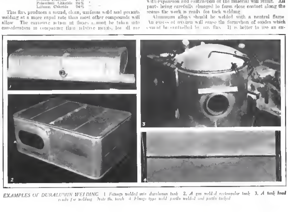
Welding Sheet Metal

Sheet material can be joined by a butt weld, a flange weld, a lap weld or by some combinations of these welds. The flange method is the most common one employed. It consists of bending up the edges to be joined with a flange about three times the thickness of the material and burning down the flange into the seam. In using either the butt weld or the lap weld, the filler rod furnishes most of the material for the joint. In joining fittings to tanks the filled type of weld is usually required.

The preparation of the work for welding starts with the layout of the detail parts. Care in accurately laying out the parts reduces the risks of damage. It is one very necessary essential in the preparation that the edges to be joined be clean. This can be done mechanically with a wire brush or steel wool or it can be done by immersing the edges for about 30 sec. in a hot caustic solution followed by a rinsing in a dilute solution (10 per cent) of nitric acid and that in turn followed by a rinsing in hot water.

The various parts of the job are then assembled, being held in place by clamps (a satisfactory clamp for flanged welds consists of a hinge with through bolt). Note particularly that beads about ⅛ in. deep follow the seams or difficulties with expansion and contraction of the material will result. All parts being carefully clamped to form close contact along the seams the work is ready for tack welding.

Aluminum alloys should be welded with a neutral flame. An excess of oxygen will cause the formation of oxides which cannot be controlled by any flux. It is better to use an ex-



EXAMPLES OF DURALUMIN WELDING 1. Fittings welded into duralumin tank 2. A gas welded rectangular tank 3. A tank head ready for welding. Note the torch 4. Flange type weld partly welded and partly tacked

cess of acetylene than to run the risk of having too much oxygen. The pressures usually worked with are 15 lb. on the acetylene tank and 30 lb. on the oxygen tank. Having a neutral flame the white inner cone should be kept away from the metal about ⅛ in. and the torch inclined on an angle of about 30 deg. The operator should endeavor to develop as light a torch as possible and must always be alert for any signs of metal falling away due to the application of too much heat. The forehand method is believed to be preferable to the backhand process. In this method the welder points his torch to his left and works from right to left the flame preheating the material in advance of the weld.

The job being ready for tack welding the filler rod is slightly heated and flux applied to the wire. No flux is put on the seams at this time. The torch is then applied to the seam between clamps and the tack welds made, the rod being used to furnish flux and to puddle. Tack welds are made at about one inch intervals. Clamps are removed. The seam is then thoroughly cleaned by means of a wire brush. The flux is then applied to the seam on both sides and to the rod. To make the weld the torch is played directly on the seam, moving it back and forth over a distance of about eight inches until the flux begins to flow. From this point on the method is the same as that used in joining sheet steel excepting that a great deal more care is necessary with aluminum to maintain good fusion and to agitate the molten metal with the wire so that the oxide film is broken.

Constant attention and a great deal of practice is essential to determine exactly when the metal is molten on account of the short temperature range between the melting point and the point where the material burns and pulls out. The determination of the correct amount of heat to apply is a matter of experience and practice and cannot be adequately described to be of benefit to the inexperienced.

Seams in aluminum castings which are to be welded are prepared by cutting away the edges on an angle of about 45 deg. The casting is then preheated at a temperature of about 500 deg. F. and the welding rod melted and puddled into the seam. To weld a cast fitting to a sheet, the fitting is first tack welded and then welded to the plate by filling in with the filler rod.

After the welding is completed the part or parts should be washed in a dilute solution of sulphuric acid or nitric acid and thoroughly cleaned of welding flux. Wire brushing and dressing of the weld are effective in removing the excess flux. Rinsing in hot water is a final essential to remove all traces of the acids and salts.

The inspection of a weld can only be a matter of visual examination without subjecting it to a test for tightness under pressure or without destroying the part. Tank, etc., can readily be tested under pressure. Etching of welded parts in a hot caustic solution will reveal cracks in the metal. The common faults with welds can as a rule be located by a visual examination however, cracks, buckling, burns, inclusions, excess flux, unevenness, etc., are the usual common faults. A good weld gives its evidence in appearance to a large extent.

In conclusion, it might be said that gas welding of duralumin presents to the aircraft builder a ready means of joining which should be taken advantage of provided the welds are used where fatigue failures and stress failures are not likely to be encountered. Other thermal methods of joining can still be regarded as experimental insofar as duralumin is concerned.

Belgian Builds Air Yacht

Capt. Alfred Loewenstein, Belgian millionaire, is having built at Croydon, England, an airplane which will be as luxuriously equipped as any yacht.

A cabin, furnished with carpets and hangings, comfortable arm chairs, which can be removed and replaced by beds for night flying and other appurtenances for travel, is being fitted up. The plane will be able to accommodate six people. A foyer at the entrance to the cabin will be heated in Winter and cooled in Summer by a diffused air system.

Monel-Plymetl

A new construction material, known as Monel-Plymetl, has been placed on the market by the Haskelite Manufacturing Corp., of Chicago, Ill. This is a panel of Haskelite, the company's plywood, faced on one or both sides with a sheet of monel-metal, or with monel-metal on one side and the reverse covered with vapor-metal, a specially prepared waterproof metal. When an absolutely flat panel is wanted, one that will not be affected by change of moisture content of the plywood core, a metal backing is necessary.

The metal face insures resistance to weather, rust and wear. Before this product was put on the market, it was subjected to thorough tests by exposure to weather and vibration.

World Records

The National Aeronautic Association has received notice from the Federation Aeronautique Internationale that new world records for airplanes established in accordance with F.A.I. regulations have been recognized by that body, viz:

CLASS C²—(SEAPLANES)
Carrying a Payload of 2000 kg. (4409 24 lb.)
Closed Circuit

DURATION (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" Isotta Fraschini engines 500 ea. at Lac Majeur
Oct. 19, 1926 — 5 hr. 41 min. 7 sec.
Former Record
Duration (United States)
Lt. G. R. Henderson, U.S.N. PN7-2, flying boat. 2 Wright T-2 535 hp. at Bay Shore, Baltimore, Md.
Oct. 25, 1924 — 1 hr. 49 min. 11 9 sec.

DISTANCE (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" engines 500 hp. ea. at Lac Majeur. Oct. 19, 1926 — 950 km. 590 3 miles
Former Record
Distance (Italy)
Guido Guidi. Dornier Wal "Idaor", 2 Rolls Royce 260 hp. at Pisa
Feb. 3, 1925 — 253 89 km. 157 63 miles

SPEED for 100 Kilometers (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" engines 500 hp. ea. at Lac Majeur. Oct. 19, 1926 — 178 005 km. p. h. 109 381 m. p. h.
Former Record
Speed for 100 Kilometers (Italy)
Guido Guidi. Dornier Wal "Idaor", 2 Rolls Royce 260 hp. at Pisa
Feb. 3, 1925 — 134 514 km. p. h. 83 582 m. p. h.

SPEED for 500 Kilometers (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" engines 500 hp. ea. at Lac Majeur. Oct. 19, 1926 — 173 587 km. p. h. 107 940 m. p. h.
Former Record. None

In accordance with Arts. 110 and 111 of the F.A.I. Regulations, "A record made by an aircraft of Class C, C-2, D or G, carrying a given useful load is broken in its category when an aircraft carrying an equal or greater load makes a better performance." The following records are recognized:

CLASS C²—(SEAPLANES)
Carrying a Payload of 1000 Kg. (2204 62 lb.)
Closed Circuit

DURATION (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" engines 500 hp. ea. at Lac Majeur. Oct. 19, 1926 — 5 hr. 41 min. 7 sec.
Former Record
Duration (United States)
Lt. Geo. R. Henderson, U.S.N. PN7-1 flying boat. 2 Wright T-2 535 hp., at Bay Shore, Baltimore, Md.
Oct. 25, 1924 — 5 hr. 28 min. 43 sec.

DISTANCE (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" engines 500 hp. ea. at Lac Majeur. Oct. 19, 1926 — 950 km. 590 3 miles
Former Record
Distance (Denmark)
M. Landman. Rohrbach seaplane, at Kastrup. Aug. 28, 1926 — 519 830 km. 311 20 miles

CLASS C²—(SEAPLANES)
Carrying a Payload of 500 Kg. (1102 31 lb.)

DISTANCE (Italy)
M. Alessandro Passaleva. Savoia Marchetti S-55. 2 "Asso" engines, 500 hp. ea., at Lac Majeur, Oct. 19, 1926 — 950 km. 590 3 miles
Former Record
Distance (United States)
Lt. H. E. Halland, U.S.N. F-5-L flying boat. 2 Liberty 400 hp. at San Diego, Calif. June 8, 1923 — 750 km. 466 miles

Aviation in the Moroccan War

The airplane has played a most significant role in the war between the forces of France and Spain and the tribesmen known as the Riffians, which was brought to a close in last Spring by the surrender of Abdel Krim. The rugged nature of the ground and the impassable condition of the roads, precluding Winter warfare, made the campaigning slow and expensive.

The aeronautical forces engaged in fighting consisted of sixteen escadrilles of Breguets (about twenty planes to an escadrille) and one escadrille of Farman Goliaths and one balloon company. The Breguets were observation and light bombing planes of the same general type as the Breguet which flew in the races at Mitchel Field in 1925. The Farman Goliaths were twin-engine bombers but smaller in size than our Martin bombers. As far as is known, the French did not use their more modern equipment in the campaign. There were, however, no enemy aircraft to contend with, and practically no anti aircraft guns, the only danger being rifle fire. The escadrilles were attached to the various divisions of army groups and worked in close connection with the other branches of the service.

Little information has come through as to the results achieved by the airplanes, and accounts of the operations seem to have been rather partisan in their character. The English papers have rather slighted the results achieved and there has also been considerable criticism in French parliamentary circles from those who claimed that too much money was spent on aviation.

As the Riffians were on the retreat almost from the start of this year's operations, the airplanes operated as an advance guard to the infantry. They bombed rebel villages far ahead of the French troops, broke up suspicious concentrations of natives and used machine guns on groups who were opposing the French advance. Where the planes operating with an advancing column could not handle a situation alone they would summon help by wireless, and other planes with bombs and machine guns would come up to dislodge the enemy. In certain cases, the aircraft did practically all the advance preparation and the infantry advanced without opposition.

During the month of May, 1926, the aerial forces in Morocco made 5,932 flights, 2,257 of which were war missions. In 1,501 bombing expeditions, 520,000 lb. of bombs were dropped, 141 wounded were transported, 2,242 photographs were taken and altogether 4,583 hours of flying were done.

Napier Engines Used in Record Flights

In a recent flight, at Warnemunde, Captain von Gronau, the Napier Lion engine has played an important part. For the Cairo-Cape Town-Cairo-England Flight, of the R. A. F. in Fairey IIID seaplanes the Napier engines were used. The long distance foreign cruise by the Royal Air Force, from Plymouth to Egypt and Cyprus, a distance of approximately 7,000 miles, was made in Supermarine Southampton flying boats equipped with twin Napier Lion engines. In the competition held at Warnemunde, Germany, during August, to determine the best seaplane, the first place went to the Heinkel plane, fitted with a 450 hp. Napier Lion engine.

In the outstanding events of the year in European aviation carrying a load of 500 kg. reached a height of three and a half miles, and, with a load of 1,000 kg., an altitude of two and three-quarter miles was reached. In attaining this record, the flier used the Heinkel-Napier seaplane.

Change of Address

The Editorial and Publication Offices of The Gardner Publishing Company, publishers of AVIATION, WHO'S WHO IN AMERICAN AERONAUTICS and THE AMERICAN AIRCRAFT DIRECTORY are located at

The Fisk Bldg., Broadway at 57th St.

Changes in Air Schedule

On Jan 1, regular stops at Bellefonte, Pa, and Bryan, Ohio, on the westbound Transcontinental Air Mail schedule were discontinued. The following schedule is now in force

Leave New York, N Y, 11 a m (Penn R R Sta.)
Leave New Brunswick, N. J, 12 15 p m (Hadley Field)
Arrive Cleveland, Ohio, 4.20 p.m E T
Leave Cleveland, Ohio, 3 35 p m C T
Arrive Chicago, Ill 7 p m

No change was made in schedule either west of Chicago or on the eastbound transcontinental

The German Institute of Air Law

With the rapid development of air transportation as a regular business throughout the major continents of the World, the question of air law and legislation relating to the air is becoming ever more of a specialized subject Many problems of an entirely new nature are continually presenting themselves to lawyers and others, with the result that a completely new sphere of study is rapidly being created

Probably the World's first effort to cope with this new view point in the legislative field is the air law section which has recently been created at the University of Konigsberg, Germany The head of the department of commercial law, Prof Dr. iur O Schreiber, has created the Institute of Air Law at the University At present, the Institute has a large library with about 1,300 volumes containing the literature of law, and especially that of air law, of nearly all the civilized nations of the World Here, Prof Dr. Schreiber and his assistant, the lecturer of the University, Dr iur H Oppikofer, give instruction and study the air legislative questions of the day The Institute also possesses many models of different airplanes

The relations of the Institute extend over the whole World, and it keeps up a correspondence with law scholars and air traffic men in the United States, China, Russia, Brazil, etc. Some time ago, the Institute entertained thirty American women students in its rooms On this occasion, Prof Dr Schreiber spoke to them of the organization and the purposes of the Institute

The Institute, in making investigations and in publishing its periodical, "Zeitschrift fur das gesamte Luftrecht," the first number of which appeared this Summer, is awakening the interest of the younger lawyers to the important questions of air law and helping them to study this law Air traffic law is also studied Prof Schreiber has, at the moment, a group of sixteen students, both men and women At present, the students are all German, but Prof Schreiber hopes that, in the future, students will come from foreign countries to make use of the opportunity of working together where facilities are excellent and with the special literature which is being collected

Colonial Air Transport, Inc. Increases Stock

Stockholders of the Colonial Air Transport, Inc, of Hartford, Conn, air mail contractors on the New York-Boston route, at a meeting held Dec. 28, increased the preferred stock of the company from $330,000 to $2,000,000., and the number of shares of no par value common stock from 6,000 to 36,000

This was preparatory to the filing of bids by the Colonial Air Transport, Inc, with the government for the operation of the two lines between New York and Chicago, which are to be turned over to private operation

Coincident with the stock increase, Major Talbot O Freeman, treasurer of the company, announced that on July 1, 1927, direct passenger and express service by plane from New York to Chicago will be inaugurated The Chicago route will be via Albany, Schenectady, Rochester, Buffalo and Detroit.

Work on Fuel Injection Engines

N. A. C. A report No 243, by Arthur W Gardiner, covering a preliminary study of fuel injection and compression ignition, as applied to an aircraft engine cylinder, summarizes some results obtained with a single cylinder test engine at the Langley Field Laboratory of the National Advisory Committee for Aeronautics. For this work a standard Liberty engine cylinder was fitted with a high compression 11 4:1 compression ratio, piston and equipped with an airless injection system, including a primary fuel pump, an injection pump, and an automatic injection valve.

The results obtained during this investigation have indicated the possibility of applying airless injection and compression ignition to a cylinder of this size, 5 in. bore by 7 in. stroke, when operating at engine speeds as high as 1,850 r p m., although the unsuitability of the Liberty cylinder form of combustion chamber for compression ignition research probably accentuated the difficulties to be overcome No difficulty was experienced in metering and injecting the small quantities of fuel required A minimum specific fuel consumption with Diesel engine fuel oil of 0.30 lb per 1 hp hr was obtained when developing about 16 hp at 1,730 r p.m. Specific fuel consumption increased for higher loads at these speeds. A maximum power output of 29 7 b. hp at 1,700 r p m was obtained but could not be maintained for more than one-half minute due to piston failure Mean effective pressures approaching standard aircraft engine practice could not be obtained, due in part, it was attributed, to the unsuitable form of the Liberty cylinder combustion chamber Excessive maximum combustion pressures were encountered when developing only about 60 lb b m.e p at 1,700 r p m, and piston life was very short The engine could be idled with regular firing at 400 r p m, but acceleration under load was not satisfactory, due probably to the fixed timing of injection during any particular run.

The Konigsberg Institute of Air Law On the left, the Aeronautic library and on the right some of the students who are studying air law

PICTURES IN THE NEWS

(Above) A FLYING MONSTER The Blackburn Iris flying boat of the British Royal Air Force is one of the largest long distance patrol seaplanes in the World It is still undergoing extensive tests in England and few details regarding it are available It is equipped with three Rolls-Royce Condor engines of 600 hp each and during tests it was demonstrated to be capable of maintaining level flight on any two engines and of performing maneuvers in this condition

(Below) PURSUIT AVIATION A picturesque view of the Curtiss Hawk P-1B pursuit plane (Curtiss D-12) in flight This machine is the standard pursuit plane of the Air Corps

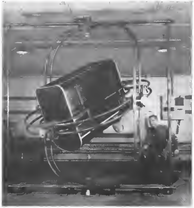
(Above) FLYING IN SWEDEN Swedish accompanied by considerable hardship as a result of the snow, ice and low temperature The photograph was taken a country flight in Sweden during which the planes landed on the frozen surface of lake Siljan Rattvik Skis are apparently used as undercarriages in spite of the ice

(Below) FLYING IN RUSSIA Experimenting conducted in Moscow by the Soviet Government with new types of airplanes with which it is hoped to institute a regular service of air communication across the frozen Siberian Steppes to the Far East 7 for the experiment is the Central Aero dynamic Institute in Moscow The picture shows one of sledge planes built for the new service As will be seen machine

(Below) A SEAPLANE CHAMPION The seaplane which won the German seaplane competition some months ago, and has since made many flights of one kind and another carrying loads The machine is equipped with Lion, 450 hp engine

(Above) AERIAL IMMIGRATION SERVICE Border patrol pilots H S Stringer and E M Sieber of the recently created immigration service of San Diego, California The pilots patrol the Mexican border near Tia Juana and Mexicali on the lookout for planes carrying Chinamen and dope from Mexico to California It is reported that some of these intruders are willing to pay as high as $500 per head for aerial transportation into the United States

(Below) GYRATING THE BEGINNER This peculiar piece of apparatus known as the "Ruggles-Orientator" is used in endeavoring to determine a man's physical qualifications for piloting a military airplane In operation the "victim" controls the orientator and it should be his object to maintain his control during certain maneuvers The gentleman on the right acts as a sort of saviour to the poor pupil to help him out when he has had enough



The Ford "Flivver" Airplane

Henry Ford's First Lightplane

SOME WEEKS ago there appeared in the newspapers frequent references to a new "flivver" airplane which had been produced by the Ford Motor Company. Barring the fact that the plane was very diminutive in size and was powered by an air-cooled engine of about 30 hp., there were no details forthcoming. During a recent visit to Detroit, a representative of AVIATION was, through the courtesy of the Ford Motor Company, given an opportunity of inspecting this highly interesting new Ford product which is described herewith.

It is understood that the production of the machine has been surrounded by a good deal of secrecy since Mr. Ford has been anxious to avoid creating the impression that he is entering the business of producing "flivver" airplanes at this time. Rather, he is merely interested in proving to his own satisfaction whether or not this type of airplane has any future, and just what his actions may be after this desire has been satisfied, is a remote question at this time.

The Ford "flivver" airplane, the first photographs of which were published in AVIATION, August 16, was designed by Otto Koppen of the Airplane Division of the Ford Motor Company and formerly of the Aeronautical Department of the Massachusetts Institute of Technology. As will be seen from the photograph, the machine is a small single seater low wing monoplane powered with a 35 hp. three cylinder radial air-cooled Anzani engine driving a propeller of approximately five feet in diameter.

Construction Details

The plane is of extremely clean appearance, there being no wires or struts, with the exception of the undercarriage struts and the simple tail unit bracing, to mar the simple aspect of the machine or to offer unnecessary resistance. The fuselage is a normal structure of wood longerons braced with steel wire and fabric covered, with a comfortable cockpit for the pilot in which his seat is so arranged that he sits high up and has an excellent view. This feature is important since an airplane of this type is not intended for long distance flying but rather for short pleasure hops and the clear wide view of the pilot enables him to make the most use of the easy slow landing qualities of the plane.

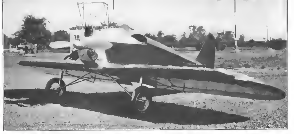
The forward end of the fuselage slopes off smoothly to cowl the Anzani engine which drives a wooden propeller especially designed for the engine and airplane by Mr. Koppen. The wing, of Gottengen 387 section (a moderately thick section), has a span of 22 ft. It is of normal wooden spar and rib construction, fabric covered and has simple elliptical wing tips. The most interesting feature of the wing which is attached to the lower longerons of the fuselage, is the flap device. Flaps extend along the entire trailing edge, divided at the fuselage. Other than these flaps there are no wing tip ailerons, the mechanism of the flaps being such as to enable either their differential operation as ailerons for lateral control or their linear operation as a means of altering the effective section, and, therefore, the lift of the wing.

The Wing Flap Device

The most interesting feature of the mechanism designed to operate these flaps, is the manner in which their operation is simplified from the standpoint of the pilot. The flaps are worked by the control column in the same sense as this column operates the elevator. Thus, pulling the stick back not only raises the elevators but also depresses the wing flaps with the result that the change in center of pressure caused by a movement of the flaps is compensated for by a change in the longitudinal balance of the plane. As a result, no special effort is necessary on the part of the pilot to correct for any use made of the flap device. Furthermore, there is a small tire friction brake attached to a tail wheel which enables the pilot to transform it into what is, in effect, a tail skid, when desirable.

The undercarriage is of the non-axle type and is extremely wide, having a tread of no less than 7½ ft. Each wheel is supported at the apex of a tripod of three steel tube struts as will be seen in the photograph. The vertical strut of each wheel incorporates compression rubber disc shock absorber, the chief point of interest regarding which is that the rubber discs are molded into brass rings previous to assemble in order to reduce to a very large extent the wear on the internal surface of each ring when in use.

One of the most interesting features of the machine is the endeavor which has been made to silence the engine. The three exhausts from the cylinders lead out into an inverted



The Ford "Air Flivver" single-seater lightplane (Anzani, 35 hp.) The U-shaped exhaust manifold was not fitted when this picture was taken.

U-shaped manifold, the outlets of which extend below the leading edge of the wing. At each of the two outlets of this manifold a standard Ford car exhaust silencer has been fitted and the result, while not by any means being the absolute silencing of the engine, is approximately a fifty per cent reduction in exhaust noises.

The only pilot who has, so far, flown the Ford "flivver" plane is Harry Brooks of the Ford Air Transport Service. He reports the plane excellent on the controls and, in fact, one of the nicest machines he has ever flown. It is very easy to fly and the position of the pilot ensures the maximum of vision. Brooks, in flying the machine, takes off straight out of the door of the building of the Ford Dearborn plant where the machine is kept. The plane leaves the ground after a very short run and has a remarkably good climb, indicating that there is plenty of reserve power. Brooks' handling of the machine is perfect, exhibiting to the greatest possible extent its excellent maneuverability. In landing, the machine has a low speed, due largely to the wing flaps, which are depressed, thus greatly increasing the lift of the wings. As soon as the tail is on the ground, the friction brake becomes effective with the result that the forward speed is checked within a few yards. On the ground, of course, the plane may be maneuvered with the greatest possible ease since there is no need to open the throttle in spurts to overcome the drag of the tail on the ground and the machine can thus be taxied along steadily and with perfect directional control. In this way the plane has been driven down the street with the greatest ease.

The Ford Flivver airplane is now on view in New York at the Showroom of the Ford Motor Company. It is equipped with a new engine being developed by the Ford Company. The engine is not at this time complete but it is a two cylinder horizontally opposed powerplant with aluminum cylinders steel lined and a two-throw crankshaft, the cylinders being offset.

The Northwest Aerial Forest Patrol

By E. Harve Partridge

Six hundred hours of flying over the heavily timbered national forests of Eastern Washington, Northern Idaho and in Montana as far East as the Continental divide in the Rockies without even a minor mishap, is the 1926 record of Pilots Nick B. Mamer and George Henry, fliers in the first patrol district.

Flying was done under the most trying conditions possible as many times the planes were flown for long periods of time always over burning timber where smoke and heat made visibility an almost absent factor and the air was hot and rough.

The fliers began their season's work on June 15 and ended the season on Sept. 15, after making complete photographic records of the burned areas. Two D. H. planes were used and, during the season, seven engines were changed, three in one machine and four in the other. The area covered by the pilots was 300 miles long and 200 miles wide and included some of the thickest and finest areas of white pine left standing in the United States. By their reports on location of fires and reconnaissance trips to report on the extent of the spread of the flames, fire fighters were able to work to the best advantage at all times.

Two forced landings were made during the season, one by each of the fliers. Mamer hit a severe bump which caused the float in the carburetor to stick and he made a landing in a field of restricted size without damage. Shortly afterward, Lieutenant Henry had to land in a small field with a broken oil lead but set the plane down without damaging it.

"Flying conditions in July over the area were the worst I have experienced in 13 years in the game", said Pilot Mamer. "Hot, dry, windy and bumpy air were encountered almost continuously and made flying difficult."

During July alone, Pilot Mamer spent 120 hr. in the air and Pilot Henry 100 hr. On one occasion, Pilot Mamer flew 14 hr. between dawn and darkness of one day, landing only for gasoline and oil and to get a hurried meal. So many new fires were starting that the patrol was worked to capacity. Fliers in Spokane said the month's flying would be close to a record for the service.

Howard R. Flint, forestry chief, had charge of aerial observation work and J. E. Jost was his principal assistant. Mechanics for the pilots were Ivan O. Cooper, Raymond Carroll and James M. Kelley.

The men who handled aerial forest patrol work over the national forests of Eastern Washington, Northern Idaho and Western Montana during 1926. From left to right they are: Observer J. E. Jost, Pilot Nick B. Mamer, Pilot George Henry and Chief Observer Howard R. Flint.

On Airplane Arresting Gears

The problem of devising some method of arresting the forward run of an airplane after landing was the subject of a paper by (England) G. H. Dowty, read to the Institution of Aeronautical Engineers recently.

The lecturer dealt first with the problem of design in undercarriages of the Oleo type, and then, turning to the other question of absorbing the machine's kinetic energy due to its horizontal component of velocity, he pointed out that the airplane, which, by reason of its speed, was most in need of some form of braking, was the only vehicle which did not use such a system. So many impracticable schemes had been proposed in the past that it was doubted if a practical solution could be found. Deck-landing aircraft, as used by the Navy, owing to the necessity of a low landing speed, suffered in regard to their performance compared with land machines, according to Mr. Dowty. Arresters permitting the use of very small airdromes would have a value in commercial aviation in the saving of initial airdrome cost and maintenance.

In designing a suitable arresting mechanism, the lecturer had in mind the hydraulic buffers used on railways, but whereas those had a short travel accompanied by a high resistance, the aircraft arrester must have a long travel and corresponding low resistance. The type he had in view would make it possible for an airplane landing at 90 m.p.h. to be brought to rest in 300 ft. without encountering a greater deceleration than once that of gravity. This would mean that the present structure of an airplane would easily stand up to the loads imposed by the arrester.

The lecturer gave some general details of the proposed apparatus, which consisted of a drum carrying a definite length of cable. The unwinding of the cable caused the drum to rotate and the mechanism for obtaining a uniform resistance was contained inside the drum. As the brake was in an entirely experimental state he was not prepared to give details of the design, but he would point out that engagement could be made at a good flying speed, and there was no necessity of shutting off the engine before landing.

Side Slips

By ROBERT R. OSBORN

Every one we have talked to seems to envy the officers making the 18,500 mile flight through the Pan-American countries. Having heard from various reliable sources of the great hospitality of our Southern brothers, we can imagine life for these fliers to be like a continuous race week program, fetes, parties, etc. The fliers are getting not only excellent training in cross-country flying, but it is probable that the rapidity with which the political map of South America changes will make good diplomats out of all of them. Think of the tact necessary to take care of the embarrassment of finding, when one comes down for breakfast, that the strange gentleman presiding at the function is the new mayor or president, elected while one was sleeping.

The fliers were fortunate in reaching Vera Cruz with less difficulty than did a friend of ours recently. This friend, while an excellent linguist, and able to speak Spanish, English and French very fluently, finds it impossible to pronounce the letter "R", and has to skip that letter altogether in his conversation. Recently, while on an automobile tour of Mexico, he was within ten miles of Vera Cruz but none of the natives could tell him which was the proper route to "Veh Cooth".

* * * *

Another flight of interest equal to the Pan-American flight is the 12,000 mile flight to India and return now being carried through by the British Air Minister and his wife. The flight is claimed to be the longest one ever undertaken by a woman, and also an epoch-making one for British aviation,—but to us the outstanding accomplishment in this trip is that of Lady Maud Hoare in limiting her luggage to one small suit case containing twenty pounds of clothes and toilet articles. We offer this as a record that will stand for some time. In fact we could mention a few American women who could not possibly make such a trip without a couple of extra bombing planes in attendance, to carry the trunks filled with clothes "wanted on voyage".

We hope Sir Samuel Hoare will be able to report better flying conditions in Mesopotamia than have previous investigators. One of our saddest moments in the last year came when Sir Alan Cobham sent back word to the newspapers that "flying at midday in Mesopotamia is rarely practical". It has always been our fond hope that some day, before we became too old, we might be able to fly at midday in Mesopotamia, and unless someone else can present a more favorable report, it seems this will be denied us.

* * * *

The Intrepid Aviator appeared to be very much worried when we saw him the other day. He had read in the newspapers that the president of the Aeronautical Chamber of Commerce had made a statement to President Coolidge that there were 5,000 planes in commercial use in the United States today. It seems that his Jenny has been out of commission for a month because of some minor trouble, and he was wondering whether or not he should telegraph to the president to change the figure to 4,999 until he could get the repairs made.

* * * *

The announcement that another polar flight was in the process of organization did not state whether or not Tex Richard, the prominent fight promoter, was taking care of the details of this battle.

It seems that all good columns should attempt to deplore something or view something with alarm at regular intervals. We admit that we have been very lacking in this respect, but will attempt to deplore something or other each week in the new year. For the present week we greatly fear that at least one more airplane will have to be added to the Coast Guard fleet completely to prevent any liquor from being smuggled into the United States. In fact it may even be necessary to have one airplane for every thousand miles of border line.

FOREIGN AERONAUTICAL NEWS NOTES

By Special Arrangement with the Automotive and Transportation Divisions, Bureau of Foreign and Domestic Commerce

Larger Plane On Buenos Aires-Montevideo Service

The Junkers Mission, which operates a tri-weekly airplane passenger and freight service between Buenos Aires and Montevideo, has replaced the single-engine seaplane formerly in use with a three-engine plane, with capacity for ten passengers instead of four, as in the plane previously used.

The new plane, recently imported from Germany, is a Junkers G-24 monoplane, of metal construction throughout, with three Junkers L-5 engines of 300 hp each.

The span of this plane is 29m. 90 cm., the length 15 m 23 cm; and the height 5 m 40 cm. The max speed is 175 km. per hr (about 109 m.p.h.), the cruising speed 150 km per hr (about 93 m.p.h.) and the min speed, loaded, 105 km per hr (about 65 m.p.h.)

New Spanish Air Service Concessions Granted

The Union Aerea Espanola has recently been given two concessions for the operation of airplane services, one between Madrid, Cordoba, Sevilla and Jerez de la Frontera, and the other between Madrid, Guadalajara, Calatayud, Zaragoza, Lerida, Barcelona, Tarragona, Castellon and Valencia. These will be under the inspection of the Civil Aeronautic section of the State and the usual conditions are imposed by the Government to guarantee the continuity of the service, the Government reserving the right to take over this line when the requisites of the national defense render such action necessary. The concession is of six years duration and the concessionary is given the period of a year to inaugurate service. After being put into operation the suspension of service of two months will be equivalent to its cancellation. A bond of 25,000 pesetas has been given by the solicitants for this concession as a guarantee for same.

More Details on Aviation in Sweden

A conference was recently held in Gothenberg, Sweden, between government officials, representatives of the Association for Air Traffic in Gothenberg, and Aktb. Aerotransport during which plans for air traffic to and from Gothenberg during the coming season were discussed.

It is believed in Sweden to be probable that the Gothenberg-Oslo line will be established, but it is also believed doubtful whether the projected line Stockholm-Gothenberg, which would enable travelers to complete the journey from Helsingfors to Hamburg in one day, will be realized. Present means would probably not be sufficient for a government subsidy, it is said.

The Royal Swedish Board of Trade has approved of Aktb. Aerotransport's application for a subsidy of 550,000 crowns during the budget year 1927-28 for commercial aviation, for 560,000 crowns for increase of the commercial aviation loan fund and for 11,653 crowns to be spent on the radio stations at the aerial ports of Stockholm and Malmo.

Air Ministry Experiments With Testing Device

The Air Ministry of England is experimenting with a device, which, it is claimed, indicates to a pilot whether his plane is flying on a straight course or in curves during fog or darkness.

The instrument, which is seven inches in diameter, contains a gyroscope and indicates by green or red luminous sectors on the dial when the plane is flying in curves or out of a straight course.

Austrian Airplane Traffic on Increase

Aerial traffic in Vienna in 1926 thus far shows a decided increase over the preceding year, according to the Department of Commerce. The number of arrivals and departures from the aerodrome Aspern (Vienna) since 1922, is shown by the following figures:

1922	644	passengers
1923	2 543	"
1924	4 134	"
1925	8,190	"
1926 estimated over	10 000	passengers.

To Oct. 20, 1926 no serious airplane accidents have occurred on Austrian territory during 1926 and only two persons were slightly injured during a forced landing. Freight traffic by air in 1926 has advanced substantially, as have also the number of ordinary letters and shipments of gold sent by that method. Up to the present time, mail has been carried by the ordinary passenger planes. In 1927 it is planned to introduce the use of special freight planes on some lines.

The services that touch Vienna are at present conferring on the 1927 schedules. Many important improvements are reported to be planned including a Winter service on some lines, notably on the routes Vienna-Munich, Vienna-Budapest and Vienna-Venice. The service Vienna-Cracow will be continued until further notice. Winter rates will probably be 25 per cent cheaper than the Summer rates, it is said. On Oct. 14, a new service was inaugurated between Budapest and Graz connecting with the existing line Vienna-Venice.

The following services will be maintained in 1927.

1) Vienna-Munich Zurich
2) Vienna-Graz-Venice and Budapest-Graz-Venice.
3) Vienna-Linz Salzburg-Innsbruck-Bregenz-Zurich.
4) Vienna Prague-Berlin (this route does not yet exist but its establishment is contemplated in order to fill a long-felt need.)
5) Vienna-Budapest (Ungarische Luftverkehrs A. G.)
6) Vienna Cracow-Warsaw Dantzig and Cracow-Lemberg respectively (Polnische Luftverkehrs A. G.)
7) Paris-Vienna Balkan (Franco-Roumaine)

The first four services are operated by the Oesterreichische Luftverkehrs A. G. with the exception of the line Budapest-Graz.

Schedules for 1927 are planned in such a manner that it will be possible to fly in one day from Vienna to Paris, Vienna to London, Berlin to Venice, via Vienna, or Dantzig-Warsaw to Venice, via Vienna.

The African Air Service Trial

As previously announced in these columns, an experimental air line between Khartoum and Kisumu, Uganda, Africa is to be inaugurated early in January. The route will be 1,400 miles long and, in the experiment, twelve journeys are to be made each way.

The plane will start from Khartoum at 7 a.m. and reach Kisumu about 1 p.m. on the following day, thus saving more than thirteen days in the journey from England, compared with existing means of transport. The Governments of Uganda, Kenya and the Sudan have each subscribed £2,000 for the project, and the Blackburn Aeroplane Company £7,000.

The machine to be used, a D.H. 50, pontoon seaplane fitted with a Bristol Jupiter 420 hp. engine, and named the Pelican, has recently been completed. It is believed however, that as soon as the line is fully established a larger seaplane may be necessary.

Italian Pilot Invents Pocket Parachute

Lieutenant Freri, of the Italian aviation forces, has invented a pocket-size parachute. Jumping from a plane at an altitude of 1,200 ft., Lieutenant Freri landed safely within a few minutes in a recent test exhibition at Genoa.

American Aircraft Directory

Many enquiries have been received by Aviation for information regarding state laws, municipal ordinances, commercial pilots, airports and aircraft operators throughout the United States. To meet this demand, the American Aircraft Directory will be published in 1927 in book form with many maps, illustrations and advertisements. As many of our readers wish this information immediately, there will be published each week, the data which has been received to date.

It is expected that many additions will be made and our readers are requested to send any corrections, additions or suggestions that they may have.

CALIFORNIA

(Continued)

ONTARIO
Ontario Aircraft Corp
W. Waterman, 226 E. J Street.
PARADISE
Thos. Penfield
PASADENA
Photomap Co., 45 East Green St.
M. DeH. Quinby, 1050 North Hudson
Lomonda Park
Frank S. Spring, 55 N. Vernon Ave.
PETALUMA
Buck-Pingpank Aircraft Co.
PORTERVILLE
W. L. Lankin
RIO VISTA
A. W. Hansen
SACRAMENTO
H. Gay Andrews, 2115 Eye St
Del Paseo Aviation Co, R F D 7, Box 1545
Ingvald Fogerskag, R D 7, Box 1545
Irwin Aircraft Corp, 1220 Yale St, S Lubin
S. E. Shelton, Irwin Aircraft Corp, 1220 Yale St
SAN DIEGO
Bird Aircraft Co, 516 Southern Title Bldg.
Bert Cooper, 2070 De Foe St.
J. E. Crosson, 3041 B St
Martin Jenson, 2630 Union St
T. C. Ryan, Ryan Flying School
Ryan Airlines, Inc, 3200 Barnett Ave.
D. W. Tomlinson, Fighting Squadron Two
Fred Young, 4341 Cleveland St.
SAN FRANCISCO
L. M. Balot, 826 Kearny St
R. P. Beebe, The Presidio
Vance Breese, Marina Field
Earl P. Cooper Airplane & Motor Co, 1501 Sutter St.
D. W. Geoble, 321 Bush St.
Harry W. Huking, Air Mail Service, Crissy Field
J. Almanzor Sarhosa, 1449 Rivisidero St.
John B. Buck, 2825 Deary St
Geo. Taylor Douglass, 1350 Third Ave.
Jos. F. Grasso, 2995 Howard St.
D. N. Larson, Van Ness at Sacramento
Otis McAllister & Co.
Francis L. McCreddin, 2 Wood St.
George E. Powers, 144 Second St
Lt. G. E. Russell, 75 Third St
Guy T. Slaughter & Co., 244 California St.
Williams Bros. Aircraft Corp, 25th & Portero Ave. P. J. Williams
Walter T. Varney, 1645 California St.
SAN JOSE
Virgil M. Cline, 829 Chapman Ave.
SAN MATE
Murphy McHenry
SAN PEDRO
F. W. Farris, 2231 Alma St
SAN QUENTIN
Bert E. Stone, P. O. Box 37967
SANTA ANA
Eddie Martin, 807 Richland Ave.
Jonnie Martin, 418 So Broadway
T. C. Peterson
SANTA BARBARA
Dwight Faulding
Longhead Seaplane Sta
Dave R. Matthews, 2019 Oak Ave.
Earle Ovington
SANTA CLARA
Arthur F. Starr
SANTA CRUZ
Milton Charles Main, Box 501
Alvin Leo Weymouth, 129 King St
James T. Young, 47 Washington St.
SANTA MARIA
Santa Maria Aviation Co
SANTA MONICA
Douglas Aero Corp
F. D. Hoyt, c/o Elks' Club
Lt. Bob Lloyd, Clover Field
K. W. Montee, 1456 Berkeley St.
SANTA ROSA
Santa Rosa Locomobile Sales Co
K. R. Semon, Box 96
STANFORD UNIVERSITY
Nathan A. Rhine, P. O. Box 62
STOCKTON
California Aerial Transportation Co
W. A. Evans, 517 Channel St
F. W. Farrm Flying Field
W. H. Gregg, Route 4, Box 380
Grover Tyler, Bennet Apt No 304
TAFT
Russell T. Geraw, Box 145
VENICE
Catron & Fisk Airplane Engine Co, P. O. 98
Crawford Airplano Co., 300 Ave. 18
Fisk Aero Co
George Lyle, P. O. Box 805, R F D 1
VISALIA
N. W. Hyde
WESTWOOD
F. A. King, P. O. Box 689
WILMINGTON
W. F. Crawford, Harbor Aviation Co

STATE DIRECTORY

AMBOY
FLYING FIELD
Municipal Field, T. R. Morgan in charge.
Location ¼ mi. from postoffice
Description 300 by 1,500 ft., Alt 650 ft., marked.
Facilities Supplies and minor repairs available.

ANGELES CAMP
FLYING FIELD
Municipal Field, owned by city.
Location Southern edge of city, inside of race track
Description 1,200 ft sq
Facilities Gas and oil obtainable in city.

ARLINGTON
AIRCRAFT and ACCESSORY COMPANIES
Prest Airplanes and Motors Co
Clarence O. Prest, Gen Manager, airplanes, supplies and shop facilities

AVALON
FLYING FIELD
Sugar Loaf Terminal, for seaplanes, owned by Pacific Marine Airways Co
Location S. of city.

BAKERSFIELD
FLYING FIELD
Municipal Airport, maintained by city Address Floyd Dunlap, Sec Kern County Chamber of Commerce
Location 4⅓ mi NW of city.
Description 3,500 by 2,000 by 100 ft., marked.
Facilities Hangars and supplies.

BARSTOW
FLYING FIELD
Municipal, operated by Chamber of Commerce
Location 1½ mi N of postoffice
Description 1,800 by 1,600 ft.; Alt 2,300 ft
Facilities Supplies available in city.

BAYPOINT
FLYING FIELD
Commercial Field, owned by W. T. Varney
Location ½ mi S of town
Description 4,000 by 1,000 ft
Facilities Hangar; supplies from town

BERESFORD
FLYING FIELD
Commercial Field, owned by Walter T. Varney.
Location S of city
Description 2,000 by 2,200 ft
Facilities Hangar, supplies in town.

BRIDGEPORT
FLYING FIELD
Bryant Flying Field; owned by A. S. Bryant
Location ¼ mi NE of postoffice
Description 2,000 by 750 ft; Alt 6,400 ft.
Facilities Supplies available

CAMPO
FLYING FIELD
Municipal Field, Charles Morgan in charge.
Location ¼ mi. N of town.
Description ¾ mi N and S by ½ mi. E and W; Alt. 2,500, marked
Facilities Minor repairs; supplies available

(To be Continued)

AIRPORTS AND AIRWAYS

Denver, Colo.

By J. A. McInaney

Tentative steps to obtain the approval of the National Aeronautic Association for the holding of the 1927 National Balloon Race in Denver, have been taken by the air committee of the Denver Chamber of Commerce.

If the balloon event is obtained, it is planned to have the race in Denver in connection with a Mile High air meet in which the leading airplane manufacturers of the United States will be solicited for entries. It is aimed to hold the meet in connection with a festival celebrating the completion of the Moffat tunnel.

Mr. Carl Wolfley, vice president of the National Aeronautic Association, and a member of the balloon race committee is quoted as saying that Denver and Kansas City, Mo., were in the field for the 1927 meet.

Attorney Phelps has said the air committee of the Denver chamber of commerce has written to Washington, D. C., office of the National Aeronautic association for full particulars on the race, the manner in which to make application for the event and the amount of the guarantee required.

If the race is obtained for Denver the air committee of the chamber of commerce will have the co-operation of the Air Service Reserve Officers Association according to Attorney Phelps.

It is believed $25,000, will be required to finance the event, which will include a guarantee of $10,000 to $15,000 to the National Aeronautic Association, but it is thought all of that expense, or at least a large part of it, can be offset by the construction of grandstands, to which an admission will be charged to those who desire a close-up view of the balloon races and the air meet.

Camden, N. J.

The South Jersey Aviation Club will hold its first anniversary at the Camden Armory Feb 14 to 19. The purpose of this celebration is to stimulate local aviation interest and boost the Camden Airport.

Efforts on the part of the backers of this project have been amply repaid to date, for it has developed that there is a keen interest in aviation in this part of the state. It is the intention of the committee in charge to promote this enthusiasm to the advantage of the Camden Airport.

Oakland, Cal.

The 1,450 acres of tide land, located on the bay shore, South of Oakland, will be converted into a municipal airport, which those who back the project, expect to make equal to the world's greatest. The location of the field is ideal, twenty minutes from the heart of the city, with deep water on one side and a railroad on the other. The surrounding country is flat and the flying conditions are the best that Southern California has to offer. The approaches of the airdrome will be protected by a golf course, which will also be laid out by the City of Oakland.

Iowa Park, Tex.

By R. L. Hughes

Iowa Park has one of the finest flying fields in this section of the state. It contains sixty acres and slopes in every direction, so that landings may be made uphill and take-offs downhill in any direction. The field is almost within city limits and is very popular with visiting pilots.

Latta Graham has purchased a new 1927 Swallow and is well pleased with its performance. Merrell Brock, who has the agency for Swallows, has sold two for Spring delivery.

Hector Gray was in Iowa Park for a week recently and has now gone to Amarillo, leaving his Lincoln-Standard for repairs. C. P. Russell and Raymond Hughes have organized an up-to-date air service and plan for a good year's business.

Miami, Fla.

By Earl M. De Noon

Rodgers Air Lines, Inc. expect to close a contract very soon with the British Government for the transmission of air mail between Miami and Nassau. A government subsidy by the British will be the means of making this line the first permanent connection by air between the United States and Great Britain.

The Chalk School of Aviation and the Chalk Flying Service contemplate several new planes this month.

The airport committee of the Miami Chamber of Commerce will meet this week to discuss the possibility of a permanent airport being established immediately.

Aero Club of Pittsburgh

By Ray A. Tucker

The Aero Club of Pittsburgh is to hold its fifth annual aviation ball on Friday evening, Feb. 4, in the ball room of the William Penn Hotel.

The event has grown to be one of the outstanding features of the social season in Pittsburgh. Also, as in every year past, it will afford many pilots of nearby and far distant military and commercial fields the opportunity of holding one of those old time-honored "high flying" reunions. The Aero Club extends a blanket invitation to all pilots and other aeronautical men to proceed to Pittsburgh upon this occasion.

The original stunts of the annual ball have always been a big hit, in connection with the entertainment program. The following members compose the ball committees: General Committee: Robert A. Laedlein, Chairman, Louis T. Barry, Halsey R. Bazley, William E. Close, Joseph M. Slater, Lawrence A. Wilson; Decoration Committee: Raymond M. Marlier, Chairman; Music Committee: Ellis C. Balsinger, Chairman; Patroness & Box Committee: Halmar D. Denny, Jr., Chairman; Publicity Committee: Ray A. Tucker, Chairman; Ticket Committee: H. Frank McCaffrey, Chairman.

Due to many requests, the Aero Club recently established a speakers bureau, whose personnel has been made up of members of the club. The Bureau will furnish speakers to luncheon clubs, business organizations, and school and church societies. Lectures will be given on "The Strides Made in Commercial Military Aeronautics". Several such organizations have already availed themselves of this service and the results have proved fruitful in stimulating greater interest in the subject.

Milwaukee, Wis.

The County Park Board on Jan. 6 approved the report submitted by the buildings and grounds committee for changes and improvements at the Milwaukee County Airport. This included the installation of two 1,000 gallon tanks and pumps for supplying gasoline to planes using the field. These improvements will cost $689.

Complete changes will be made in the lighting system used on the field, the contract for this having been awarded to Thomas Hamilton, President of the Hamilton Aero Manufacturing Co. Improvements in the drainage system will also be made through the use of larger tubing.

The Northwest Airways, Inc., air mail contractors between Chicago and Minneapolis, is to use the hangar one year free of charge, but will pay for all mechanic's services, gasoline and oil.

The original appropriation for the work was $150,000, but a request for an additional $25,000 will be made to the county board. The board agreed to pay $500 for the hangar now on the former Lisbon Road Airport, and accepted the offer of M. Warshauer for the hangar owned by him on the Lisbon field.

The name of the field has been officially designated as the Milwaukee County Airport. It has heretofore been known as Hamilton Field.

UNITED STATES AIR FORCES

McCook Field

Since the advent of the present standard pursuit planes, inverted flying, especially in exhibition work, has been very common. This is due to the ease with which these planes may be rolled on their backs.

Last Spring, at McCook Field, one of the pilots took up a P-1, and executed a series of maneuvers while another pilot flew a DH alongside. The DH had a photographer in the rear cockpit and he took moving pictures of the P-1 as it maneuvered.

The most interesting picture was one showing where the P-1 rolled slowly on its back (around the longitudinal axis) using the ailerons. The pilot then pushed forward gently on the control stick and the plane gradually climbed and stalled, the speed falling off from about 160 to 70 m.p.h. The rudder was then kicked hard over, the stick pushed full forward and the plane went into an inverted spin. The feeling is somewhat similar to that experienced in an ordinary spin but much more uncomfortable. The controls seem sloppy and do not act as quickly. Altitude is lost very rapidly, and even after the plane stops spinning it takes about a thousand feet to get it off its back out of the dive, and in level flight. During this time the uncomfortable and unaccustomed attitude of the pilot makes the time in the maneuver appear much longer than it actually is. In the case cited the pilot thought he had made at least four turns of a spin before starting to come out. The movies showed only a turn and a half. The altitude lost was about three thousand feet, or about three times that required for a turn and a half of a normal spin.

The method of getting out of the spin was to pull back on the stick and reverse the rudder and ailerons. In a particularly difficult case it might be advisable to lock the elevators and jazz the motor.

In executing the inverted spin and, in fact, whenever flying on one's back, it is recommended that the safety belt be made as tight as possible and that a rubber band, made of a piece of inner tube about one inch wide, be placed over the snap of the safety belt fastener so it cannot accidentally become unhooked.

Spokane, Wash.

By E. Harve Partridge

After battling fog, snow, mist and rain for 1000 miles, Captain Arthur E. Easterbrook, regular army instructor, attached to the 116th National Guard observation unit here, arrived in Spokane recently with one of the new Douglas O-2C airplanes. He was accompanied on the trip by Captain Ed Axberg, of the guard.

A non-stop trip of 750 miles, from Red Bluff, Cal. to Spokane was made and the engine stopped, all gas tanks empty, as the plane was taxied to the government hangar.

Captain Easterbrook reported that they covered stretches as long as one hundred miles without seeing a human habitation. Despite sub-zero temperatures, the engine functioned perfectly all the way and except for suffering from cold, the flyers completed the trip without special incident.

The plane was turned over to the guard and Captain Easterbrook is now giving guard officers time in it. His instructions

are to personally supervise the training and solo each officer

A Jenny, which the guardsmen would like to use to race other fast ships of the type, is the pride of the unit. It has ailerons only on upper wings and its air speed indicator shows it makes 83 m.p.h. in level flight. The 150 hp. Wright-Hispano is reported to turn over 1700 r.p.m. in the air. Charlie Hilter, master mechanic of the unit, tuned it up.

Captain Easterbrook has been named president of an examining board to meet in Vancouver, Wash. in January to test applicants for flying corps commissions in the regular Army.

Despite six to eight inches of snow, and temperatures which have dropped as low as zero, guard planes have been in the air every day of the Winter.

Improvements at Bolling Field

A contract for the improvement of Bolling Field, D. C., was recently let to Pagenhardt & Company, of Philadelphia, for $15,078., covering the furnishing of material and equipment for construction of a boiler house and a heating system in the machine shop.

Club-house at Nashville for Airmen

Members of the 30th Division, Air Corps., Tennessee National Guard, are very anxious that Army pilots visiting Nashville, make use of their newly established club house, located in the heart of the city, at 1404 Broad Street. Major John C. Bennett, Jr., commanding the Tennessee unit, states that rooms are always available for visiting pilots.

Aircraft Squadrons to be Manned by Enlisted Pilots

The commander of the Aircraft Squadrons Battle Fleet has reported to the Navy Department that on Jan. 1 the Fighting Plane Squadrons two and six were reorganized and will in the future be manned by enlisted pilots. As in the past, the administration and tactical command of the squadrons will remain with commissioned officers attached to the squadrons. This is the first instance in which enlisted men have been organized as a unit of the aviation forces of the Navy. Under the recent legislation affecting aviation, it was specified that by July 1, 1928, thirty per cent of the number of pilots in the Navy should be enlisted men.

The Fighting Plane Squadrons are at present based on the experimental aircraft carrier Langley. They are fast one-seater planes, used for pursuit purposes. Each squadron is composed of eighteen planes.

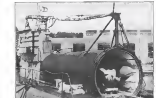
When the new aircraft carriers Lexington and Saratoga are completed, which will probably be in the Summer of 1927, they are to be equipped with two fighting squadrons, two torpedo and bombing squadrons, each of sixteen planes. The Saratoga will also carry an observation squadron of twelve planes and the Lexington will carry an observation squadron of six planes. This will give the Saratoga a total of eighty planes and the Lexington a total of seventy-four planes. In addition, each carrier will have in reserve, as replacements, about one third additional planes.

To Define Secretary Warner's Status

The Navy Department has requested congressional action in amending the existing law so that in the temporary absence of the Secretary of the Navy, Edward P. Warner, Secretary of the Navy for Aeronautics will have the same authorization to act that Assistant Secretary Robinson now has.

At present the law provides for the duties of the Secretary to devolve on the Chief of Operations "During the temporary absence of the Secretary of the Navy and the Assistant Secretary of the Navy." The bill favored by the department amends the provision contained in the act approved March 3, 1915, providing that the Chief of Naval Operations, during the temporary absence of the Secretary and Assistant Secretary of the Navy, shall be next in succession to act as Secretary of the Navy as follows: "During the temporary absence of the Secretary and the Assistant Secretaries of the Navy, the Chief of Naval Operations shall be next in succession to act as Secretary of the Navy."

Under the general statute the duties of the head of any department, during his temporary absence, automatically devolve upon the "first or sole assistant thereof." It is an interesting commentary that there is no official first and second Secretary of the Navy, both Mr. Robinson and Mr. Warner being assistant secretaries. It is generally accepted that under the new law the duties of the office would fall on Mr. Robinson.



A picture showing the S-1 submarine plane packed away on the deck of the submarine

Submarine Plane Development

One of the outstanding problems in the development of Naval aviation is the production of aircraft which lend themselves favorably to storage in confined spaces, thus enabling airplanes to be carried to sea with the fleet. While these problems have been very satisfactorily tackled, and, to a large extent, solved, in the case of airplanes to be used on aircraft carriers, the problem of storing airplanes in the confined spaces available in a submarine is very naturally a difficult one.

The Bureau of Aeronautics, however, has given this question a good deal of attention, with the result that the S-1 single-seater scout has been developed.

This airplane, which is purely experimental, is powered with a small 3-cylinder Anzani engine. It is stored on the deck of the submarine in a cylindrical container, the complete airplane being packed up, with the pontoons and wings strapped close to the body.

Army Air Orders

Sec. Lieut. Mason H. Lucas, Air Corps, Brooks Field, to Fort Sam Houston.

Major Charles C. Merz, Air Corps Res., Indianapolis, to active duty, Washington, D. C., reverting to inactive status Jan. 23.

First Lieut. James Baker Dickson, Air Corps Res., Evanston, Ill., to active duty Chanute Field, reverting to inactive status June 30.

First Lieut. Francis Cornelius Crawley, Air Corps Res., Dorchester, Sec. Lieut. Jesse Beecher Stowe, Air Corps Res., Sacramento, and Sec. Lieut. Irwin Alberta Woodring, Air Corps Res., Tulsa, to active duty Selfridge Field, reverting to inactive status June 30.

First Lieut. John Franklin Egan, Air Corps Res., Brooklyn, N. Y., to active duty Langley Field, reverting to inactive status June 30.

First Lieut. John Manfred Hager, Air Corps Res., Washington, D. C., to active duty in the office Assistant Secretary of War, reverting to inactive status Dec. 29.

First Lieut Robert T. Cronau, Air Corps, Kelly Field, San Francisco, sailing Apr 23 for the Canal Zone.

Navy Air Orders

Lieut. (jg) Raymond B. Drinan det Aircf. Sqdns, Battle Fleet, to Asiatic Station.

Lieut Comdr Frederick Ceres det. VS Sqdn. One, Aircf. Sqdn, Setg Fleet, to staff Aircf Sqdns, Setg Fleet

Lieut. (jg) Winfred P. Dona det. USS Wright, to Setg Plane Sqdn One, Aircf. Sqdns, Setg. Flt

Lieut (jg) Clifton A. Young to Torp & Bomb Plane Sqdn. One, Aircf Sqdns, Setg Fleet. Orders Oct. 16 revoked.

Lieut Comdr Daniel E Barbey det N.A.S., Pensacola, to temp duty Rec Bks, Puget Sound.

Lieut (jg) Paul E. Roswell det N.A.S., Pensacola, to VT Sqdn One, Aircf Sqdns, Setg Fleet

Ensign Crutchfield Adair det N.A.S., Pensacola, to VT Sqdn. Two, Aircf, Sqdn, Battle Fleet

Ensign Herbert R. Bollinger det. N.A.S., Pensacola, to VT Sqdn. Two, Aircf Sqdns, Battle Fleet

Ensign Bromfield B Nichol det N.A.S., Pensacola, to VT Sqdn. One, Aircf Sqdns., Setg Fleet

Lieut (jg) Lawrence F Connolly det. Nav Air Sta., Pensacola, to temp duty USS Chewink.

Lieut (jg) John P. Whitney det VS Sqdn, One, Aircraft Sqdns., Setg Fleet, to Nav. Air Sta, Pensacola

Capt Frank R McCrary det command USS Langley, to Aircf. Sqdns., Battle Fleet

Lieut Comdr James H Shoemaker det. VF Sqdn Two, Aircf Sqdns., Battle Fleet, to command VF Sqdn Two, Aircf Sqdns, Battle Fleet

Lieut Comdr Frank D Wagner det Aircf Sqdns, Battle Fleet, to command VF Sqdn. Six, Aircf. Sqdns, Battle Fleet

Lieut Elwood H Barkelew det. Nav Air Sta, Coco Solo, C Z., to VO Sqdn One, Aircf Sqdns., Battle Fleet, USS Colorado

Lieut Frederick R. Buse det VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet

Lieut George F Chapline det VO Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Two, Aircf Sqdns, Battle Fleet

Lieut George H. Hasselman det. VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet

Lieut Wallace B Hollingsworth det Nav Air Sta., Coco Solo, C Z, to VO Sqdn Two, Aircf Sqdns., Battle Fleet.

Lieut Nolan M Kindell det Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet.

Lieut Thomas B Leet det VF Sqdn Two, Aircf Sqdn, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet

Lieut John E Ostrander det VF Sqdn Two, Aircraft Sqdn to VF Sqdn Six, Aircraft Sqdns., Battle Fleet

Lieut Daniel W Tomlinson det VF Sqdn Two, Aircf. Sqdns Battle Fleet, to VF Sqdn Six, Aircf Sqdns., Battle Fleet

Lieut Frank W Wead det VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircraft Sqdns, Battle Fleet.

Lieut (jg) Edward C Ewen det VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet

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Lieut (jg) Harold G Hazard det VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet

Lieut (jg) Robert F Hickey det. VF Sqdn. Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns., Battle Fleet

Lieut (jg) Henry F MacComsey det. VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf Sqdns, Battle Fleet

Lieut (jg) Aaron P. Storrs det VF Sqdn Two, Aircf Sqdns, Battle Fleet, to VF Sqdn Six, Aircf. Sqdns., Battle Fleet

Ensign Walter V R Vieweg det Nav Air Sta., Pensacola, to VT Sqdn Two, Aircf Sqdns, Battle Fleet.

PUBLISHER'S NEWS LETTER

Occasionally there passes out of the lives and affairs of men a rare character whose quiet and self-effacing guidance has had an important though unknown influence on the trend of some particular sphere of work. All achievement, no matter how material, is in its last analysis merely the reflection of an idea and all ideas are moulded by surroundings, opportunity and character. True modesty carries with it a reticence that not only does not wish praise and appreciation but regards it as entirely out of place Some receive great honor in life but are soon forgotten The genuine and enduring work of others goes on long after their last kind act Such a man has gone out of the lives of many and were it not for the influence he has had on aeronautics in this country, these cryptic words would not have been written He would have preferred none.

* * * *

Whenever the subject of air transport, particularly the carrying of passengers is discussed, the element of time saving is always accepted as a demonstrated fact without the close analytical and statistical consideration that safety receives It is commonly stated that a few hundred miles can be covered three times as quickly by airplane as by train and the conclusion is assumed that the time gained is time saved Little is said of the time *lost* Air traffic in goods is entirely for business gains and that means saving of time between the hours of 9 A M and 5 P M On long main airlines such as the trans-continental air mail where the traffic moves night and day the comparison is justifiable. But where there is night train service between two points and no night flying, sending goods by air can often cause a delay owing to the time consumed during the working hours. Except on feeder lines with night flying connections and on very long routes, the time consumed should be given as much attention as the time saved.

With passengers, the whole problem changes which makes the carrying of goods and passengers so difficult where there is only one schedule Air travellers use aircraft for three reasons; first, for the thrill they think they will get and to have something to talk about, second, to see the country while on a pleasure trip and avoid the inconvenience of slow trains; third, to save time for business reasons The first class may be disregarded as they will soon disappear The pleasure seeker does not care anything about saving time. The business man does want to save time and the time he wants free is during the day when business is being done. It is just as logical to figure as a part of the cost of travel, the hours consumed in the air at an hourly rate of salary as has been done in showing the value of the time saved by air travel by multiplying the hours saved by the supposed hourly income In other words the success of air traffic will depend largely on the savings in time it can make during the daytime

* * * *

This leads to another point Most of the comparisons in time saving have been made with train service Soon, if not now, the automobile bus will have to be reckoned with. Where train service does not exist or is infrequent and slow, the bus is rapidly coming into use. In the Syrian Desert, East of Palestine automobiles cross the desert and steppe and reach Baghdad in twenty hours. This trip formerly required twenty to sixty days The airplane can cross it in about ten hours In one year this automobile line carried 1476 passengers and 3500 pounds of mail. Arriving at Baghdad, the journey may be continued to Kermanshah, Persia a distance of 222 miles which formerly took eight days and now only twelve hours by automobile Teheran, 650 miles away can be reached in four days as compared with the old time of thirty-two days of dusty dreary mountain and desert riding Mosul which is 230 miles north of Baghdad has maintained communication with Harun al Raschid's capital in two ways, by road which took ten days or by floating down the Tigris River on a comfortable raft, a journey of a few days to two weeks depending on the season of the year Now the trip is made in twelve hours

* * * *

These facts show the development only in a small though inaccessable area. All over the world wherever there is traffic, the extensions are the same The airplane has a real competitor in the automobile bus, particularly for day traffic. All of which should show how essential it is to prepare, plan and develop all possible night flying facilities. More success to Secretary Hoover in his efforts to get a little money out of Congress for the equipment of night airways.—L D G

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